NATURE NOTES

on

100 Subjects

—DIXON

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NATURE STUDY NOTES

(REVISED AND ENLARGED)

100

OF THE MOST ABUNDANT INSECTS
BIRDS AND WILD FLOWERS
IN NEW ZEALAND

Descriptions and Interesting Habits of each, Classification of all Insects, 27 Birds' Nests, 31 Birds' Eggs and 16 Poisonous Plants: also Songs of Birds (in Tonic Sol-Fah), etc.

WITH 70 ILLUSTRATIONS

BY

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PREFACE

IT is hoped that this small book, with the helpful guidance of teachers or parents, may be of some assistance in enabling boys and girls to become so well acquainted with the most common insects, birds and wild flowers that they will not only recognise these in their walks in the country or in the town parks, but also recall associated facts about them. With this habit established, it will be found that most boys and girls will then be eager to seek for more complete knowledge of nature's wonders. "Nature Study" lessons should either be given "out-of-doors" or with specimens which can be brought within easy view of every scholar in the class. It is unnecessary to offer any further suggestions to trained teachers as to the methods to be adopted in lessons on the topics contained in this book. Almost the whole of its contents can be elicited from scholars whose powers of observation, comparison and contrast are guided by suitable questions, provided that the condition above-mentioned is observed. Further comments on the means by which suitable illustrative objects may be obtained are contained in the "Introductory Notes" which commence each of the three parts of this book. The writer gratefully acknowledges his indebtedness to Mr. R. A. Falla, M.A., ornithologist, Auckland War Memorial Museum, the collections in the Birds and Plants Sections of this Museum, and to the late Miss Vaile's book, "Fairy Tales From N.Z." for some of the details given in the following pages.

M. H. DIXON.

Auckland,
18:vii.:34.

PREFACE TO SECOND EDITION

I gratefully acknowledge the encouraging reception accorded to this book by School Inspectors, Agricultural Instructors and Teachers—also helpful criticisms from Messrs. J. Brydon Hogg, B.Sc., B.Ag., Chief Agricultural Instructor, Wanganui, F. C. Brockett, Agricultural Instructor, Wairarapa District, and E. G. Turbott. Some of the facts contained in these criticisms are included amongst the additions made. In response to several requests, this edition also contains additional pages of illustrations.

The illustrations in this book were produced from sketches and photographs by the writer, or reproduced from illustrations contained in "Bulletins" and "Journals" published by the Department of Agriculture, New Zealand, and in a pamphlet on "The Kiwi" by Mr. H. R. Haeusler, R.A.O.U.

14 :vi. :35. M.H.D.

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CLASSIFICATION OF INSECTS

CLASS NAME	WINGS	EXAMPLES	REMARKS
Aptera	None.	Silver fish, springtails.	Inconspicuous; no cycle (insect-egg-insect).
Hemiptera	Four, but all are imperfect.	Aphides and scale insects.	This class includes most of the parasite insects; no cycle (insect-egg-insect).
Orthoptera	Four, two gauzy and two leathery (protective).	Locusts, grasshopper, cricket, mantis, weta.	The class of greatest variety; no cycle (insect-egg-insect).
Neuroptera	Four, gauzy and all approx. the same size.	Dragon flies, the may-fly.	All the wings are covered with a network of veins.
Hymenoptera	Four gauzy, but two different sizes.	Cicada, bees, wasps, ants, ichneumon fly.	Food is chiefly the nectar of flowers.
Diptera	Two, gauzy.	Flies, including crane-fly (daddy-long-legs), mosquito, sheep-ticks.	Feed by piercing and sucking; nature's scavengers.
Lepidoptera	Four, mealy or dusty.	Butterflies and moths.	See Introductory Notes for distinct differences between them.
Coleoptera	Four, sheath wings.	All the beetles including lady-birds.	There are more than 3,000 species in New Zealand.

The Class Names given above are unsuitable for use in lessons to junior scholars. They are derived from the following Greek words:—ptera, wings; a-, none; hemi, half; orthos, straight; neuron, a nerve; hymen, a membrane; di, two; lepidos, a scale; koleos, a sheath. All except those in the first three classes have the life cycle: egg-larva-pupa-insect.

Nature Study Notes

PART I.—INSECTS

INTRODUCTORY NOTES

An insect must have: (1) Head, chest and abdomen; (2) antennæ (feelers); (3) six legs—no more, no less. Hence spiders, centipedes, and many other crawling creatures should not be called insects.

The usual insect cycle is **egg, larva, pupa, insect.** (Plural number of larva and pupa are larvæ. pupæ.) There are three kinds of larvæ, viz., caterpillar, grub and maggot.

CATERPILLAR has three pairs of feet and from two to five pairs of fleshy "crawlers."

GRUB has three pairs of feet, but no "crawlers."

MAGGOT has neither feet nor "crawlers" (e.g., maggots of blowfly and honey-bee).

PUPÆ of many different insects can be found amongst dead leaves and weeds, or when digging in the garden, especially in the months of March and April. If these are placed in glass jam-jars or jelly-jars, each having a shallow layer of soil on the bottom and a perforated lid, the scholars will in time get evidence of the different kinds of insects which have this previous stage of existence. By means of a glass-fronted box in which half-a-

dozen woolly-bear caterpillars and suitable food have been placed—groundsel, sowthistle, or ragwort leaves for the grubs, and honey or syrup for the moths—the complete **"cycle"** of the pretty Day-flying Moth is easily obtained. A larger box, placed in a firm position, and provided with a 6in. x 4in. door at each side—as well as glass front—constitutes a **School Insectarium,** available for use by two or more different classes. (Cost: Piece of glass 1/6, box 1/-.) To avoid monotonous repetition, the "cycles" are not described in the following pages, except for those insects the cycles of which have some special interest. The use of hand-magnifiers is very desirable in all lessons on insects.

The **"Blue Fairy Butterfly"** is frequently miscalled a moth, and the **"Day-flying Moth"** is just as frequently miscalled a butterfly. **Butterflies** usually fold their wings in an erect position above their backs when they alight; **moths** do not.

The **antennæ** (feelers) of a butterfly differ from those of a moth. The latter resemble two strands of a small feather; the former are like single fibres with a small knob at the free end of each fibre. Butterflies have slender bodies; those of the moths are thicker and coarser. If scholars are told the fact that there are more than 3,000 different beetles in New Zealand and hundreds of different moths, they will not expect to be supplied with the name of every insect they collect. The description of each insect can be supplemented by reference to the "class" to which it belongs. (See "Classification of Insects," page 8.)

THE MANTIS

DESCRIPTION—Grass green colour. Long, flattish **neck,** protruding **eyes, wing cases** edged with yellow. When at rest it usually stands on four legs, whilst its front legs are held up close to its body. (Hence, sometimes called the Praying Mantis.) Has four **wings,** two hard and two gauzy. Its front legs are orange coloured on the inside with a peacock blue mark in the middle of each. When examined under a magnifier, these marks are very beautiful, each of them resembling the end of a peacock's feather. The **ears** of the Mantis are located in them. The "foot" section of each front leg is like a narrow pair of pruning shears, and is used by the Mantis for catching its prey.

FOOD—Small insects, especially flies. It will not eat a wounded or dead fly. It is, therefore, necessary to catch insects intended for its food by placing a glass jar over them, introducing the Mantis afterwards. When about to catch its prey, the Mantis stands with its front legs folded in front of its body, and slowly swaying the upper part of its body to right and left. When an insect comes within reach, the Mantis makes one swift dart and seldom misses its prey. It cleans its head after every meal, using its forelegs for this purpose in a way very similar to that of a cat.

CYCLE—The female Mantis makes a **"nest"** of frothy, soapy substance, gumming it to a fence-post, twig, window-sill or similar projection, to which it becomes very firmly attached. **Size** of nest, about $\frac{3}{4}$in. x $\frac{1}{4}$in. **Colour**, when first made—

April, May or June—is creamy white; this changes to dull brown. **Shape,** loaf-shaped with crinkled tops, where the Mantis has placed her numerous eggs. These hatch six months later (October-December). Nests found in late spring or in summer months should be placed in glass jars, or in the School Insectarium, so that scholars may have the interesting and amusing experience of seeing the antics of the peculiar young insects as they emerge from the nest. Old empty nests can be recognized by the double row of tiny holes along the top of each.

NOTES—The Mantis is one of the orthoptera (see p. 8). These insects have no "larva" and no "pupa" stage. Fully-grown specimens are fairly numerous in the foliage of hedge plants and ornamental shrubs during the months of March and April. (See illustrations, pp. 13, 29.)

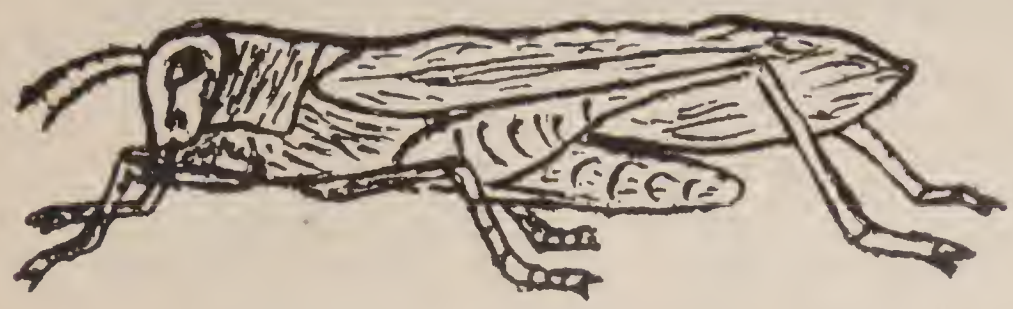
THE CICADA

DESCRIPTION—Frequently miscalled a locust. (See pp. 8, 13.) **Head,** short and broad, with large prominent eyes. There are also three tiny eyes, forming a triangle on top of the head. **Antennæ,** or feelers, very short. **Wings**, four, gauzy.

SONG—On a sunny day, the male Cicadas are heard "singing" almost continuously—

ezzz . . . . click, clack
ezzz . . . . click, clack

whilst resting on a post, tree branch or wall. The "click clack" noise is made by beating the tough edges of their wings against the wood or wall material. The "singing" ezz noise is made by the

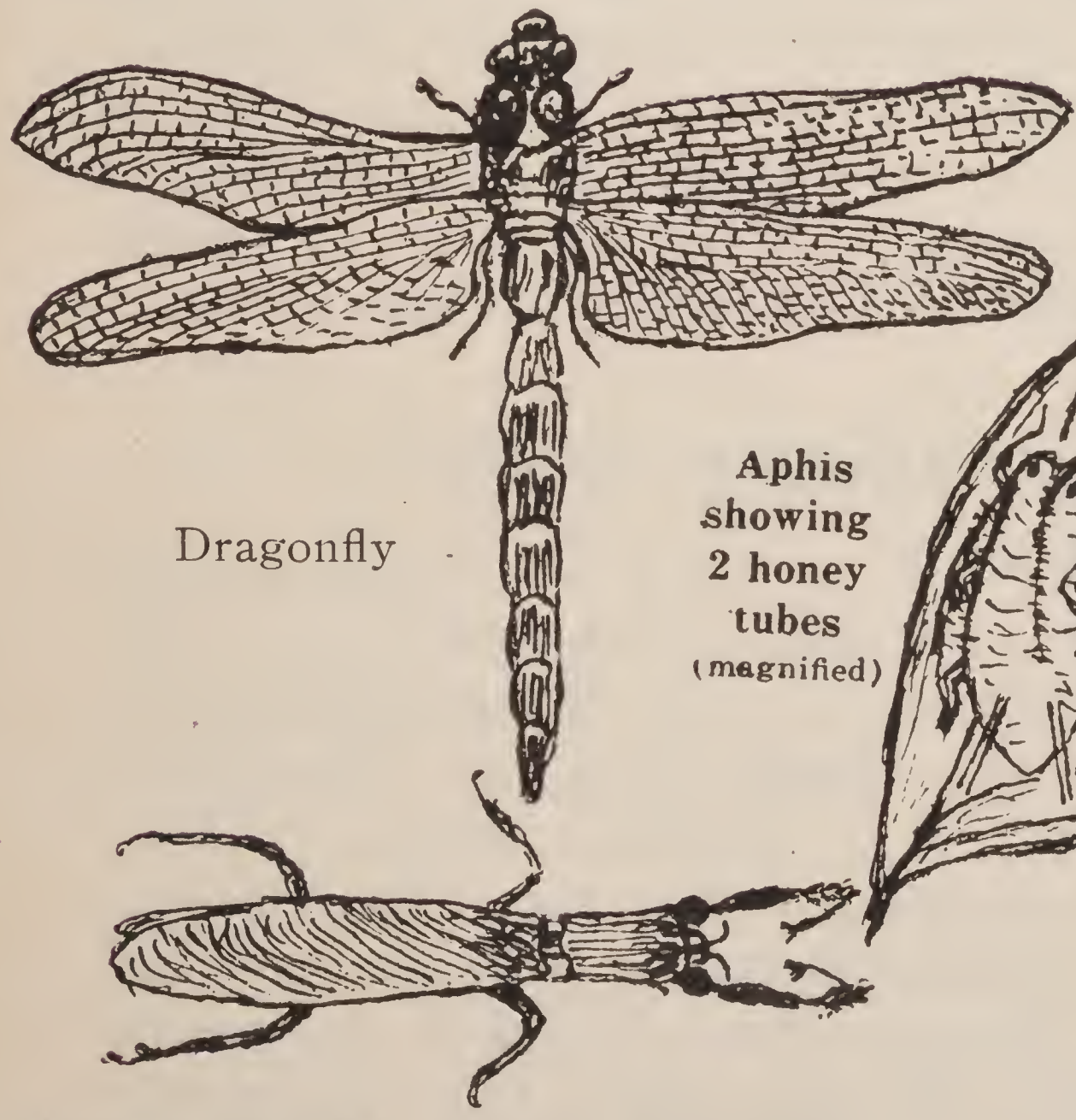


The Common Locust

The Hover Fly

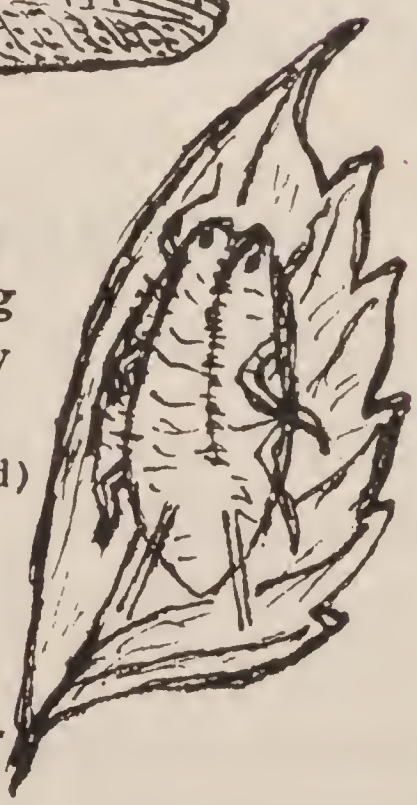
Blue Fairy Butterfly

Day Flying Moth



Dragonfly

Aphis showing 2 honey tubes (magnified)



Mantis, showing complex structure of front legs

Back view of Cicada, showing 5 eyes and 4 wings

mutual action of the protruding muscles and a stretched vibrating membrane which are under the wings.

CYCLE—The female lays about 500 eggs in cracks in the bark of tree twigs. The larva from each egg drops to the ground and lives on the root juices of bushes and trees as a beetle-shaped creature for several years—sometimes seventeen. Eventually it makes its way to the surface on a hot day, climbs the trunk of a tree and digs its front claws firmly into the bark. Its outer covering skin splits, and the Cicada emerges—usually about 9 p.m. Scores of empty "nymph" skeletons can be found on tree trunks in the summer months.

NOTES—The Cicada loves the hot weather, and on hot drowsy afternoons it is heard at its loudest. The male Cicada is never seen feeding after it becomes a fully-grown insect, but the female is voracious, devouring a large quantity of tender leaves and shoots. (See number of eggs laid.)

THE MASON WASP

DESCRIPTION—It is not a wasp, but a large black fly with body shaped like that of a wasp. (See p. 8.) It also has a sting. **Wings,** two, gauzy (wasp has four). **Nests**—Position: Key-holes, picture frames, folds of hanging clothes, window-ledges, picture-hanging rail, etc. Description: About six oval compartments or cells, made of mud or clay which the wasp has carried in its mouth. How made: One cell at a time; the wasp places a large number of spiders in it, having previously

benumbed them by stinging. It then closes the cell and commences to build another, adjoining the first. Sometimes two rows of cells are made, one row below the other, with a thick clay partition between them. (Illustration, p. 30.)

CYCLE—Female wasp lays an egg in the body of one spider in each cell. A cream-coloured grub emerges from the egg, devours the bodies of all the spiders in the cell, packing all their legs into one corner. The grub then spins a silky covering (cocoon) around its body and changes into a reddish-brown "pupa." About a week afterwards a Mason Wasp makes its way out of the pupa skin in which it has gone through the change of producing its wings, etc. (metamorphosis).

NOTE—The young grub gets "fresh" food, as the benumbed spiders live for some days after being placed in the nest.

THE "BASKET" MOTH

DESCRIPTION—Also called the Case Moth. The Moth itself is seldom seen, but the "cases" made by the caterpillars which hatch out of the moth's eggs are well known. They are tubular in shape with the lower end pointed, and are found suspended from all sorts of places—window-sills, edges of weatherboards, twigs, etc. They are large, sometimes being nearly three inches long. Colour: Dark brown, almost black. Material: Very tough, being hard to cut, even with a pair of scissors. They are lined inside with silk fibres made by the large black caterpillars which live inside them.

HABITS—The caterpillar remains in its house during the day-time, feeding on tender leaves and shoots at night-time. It can close or open the broad end of its "case" by means of silk strands, pulled or stretched from inside the bag. When feeding, the caterpillar crawls about, dragging its "house" on its back. (Cf. the shell-back snail.) It lives thus for 18 months.

Case Moth's House

CYCLE—The caterpillar changes to a "pupa" inside the bag. If the moth, which emerges a few days later, is a male insect, it makes a hole in the bag and flies away. If a female, she lays her eggs in the bag and dies in it. Young caterpillars are hatched from these eggs in November, eat their way out of the old "case," and make similar homes of their own.

NOTES—If a hole is carefully cut in the side of a "case" in which a caterpillar still exists, it will repair the damage the same night, and do it so well that it is almost impossible to find the cut next day. Often other insects, etc., are found in old bags from which the young caterpillars have previously escaped. They make warm shelter places for two or three years.

THE WHITE BUTTERFLY

DESCRIPTION—Large size, white wings, black dots near the edges of two wings. (See p. 30.)

CYCLE—Female moth lays its eggs on under-parts of the leaves of any plant of the cabbage family. Tiny caterpillars hatch out in three or four days and soon make their way into the heart of the plant. They continue eating holes in the leaves for nearly four weeks, then change to pupæ, which are often found under buildings. Butterflies emerge from these in seven or eight days. There are five or six generations during a New Zealand summer, and the butterfly is now considered to be our worst garden pest. Caterpillar is velvet green with faint gold stripes.

EGGS—Very small, yellow and pointed; found singly, not grouped, from 20 to 120 on each plant leaf or part of building.

NOTES—If young cabbage plants and turnip plants are dusted with pyrethrum powder so that powder sticks to the under parts of the leaves, this will prevent the butterflies from laying their eggs on the leaves. A cheaper, but more time-taking method, is to spray with water in which soft soap (2 oz. to 1 gal.) and golden syrup or treacle (1 tablespoon per gal.) has been dissolved.

The caterpillars from the eggs of the **Diamond Back Moth** also eat holes in the leaves of cabbages, etc. They can be distinguished by the rapidity with which they loop and crawl along the leaf when disturbed, or else drop towards the ground suspended to the leaf by a fine silken thread. A parasite insect which feeds on the caterpillars that emerge from the White Butterfly's eggs has recently been introduced into New Zealand, and is said to be producing promising results. (See p. 18.)

Diamond Back Moth.

1. Leaf of cabbage, much reduced, showing caterpillars and cocoons, natural size. 2. Moth, natural size, flying. 3. The same at rest. 4. Caterpillars dropping to the ground when disturbed. 5. Moth magnified.

THE RED ADMIRAL BUTTERFLY

DESCRIPTION—Probably the most attractive of the common butterflies of New Zealand. **Body,** dark brown. **Antennæ** (see p. 8). **Wings** almost black, each of the upper ones having two bands of white markings near the tip, and a red band nearer the body of the insect. Each of the lower wings has a broad band of red, dotted white and black, near the outer edge.

CYCLE—Female Butterfly lays its eggs in the axil of a leaf near its connection with the stem of the plant. The **caterpillars** from these eggs are easily recognizable—black colour with red dots and white markings; large size; small tufts of black hairs along each side of the body. The **pupa** has a hard skin, and is usually suspended by tail from small branch or fence.

BLUE FAIRY BUTTERFLY

DESCRIPTION—Also called the Common Grass Butterfly. First name is due to its size—smallest butterfly in New Zealand—and blue colour of its wings. Most children miscall it a moth. Under parts of its wings are a dull grey colour, and this makes it almost invisible except when in flight or resting on a flower with light-coloured petals. **Antennæ** (see pp. 9, 13).

NOTES—On hot, sunny days it is seen in hundreds on the wild flowers with yellow petals, also on similar garden flowers. It is also fond of the nectar of Michaelmas daisies. On account of the delicate structure of its wings, it is difficult

to capture good specimens for indoor examination. It is, therefore, necessary to make observations in the school garden, choosing a sunny day in summer.

THE PAINTED LADY BUTTERFLY

DESCRIPTION—One of the prettiest of New Zealand butterflies, but not so large as the Red Admiral. **Body,** medium brown colour. **Wings,** same colour as body, with lighter shades near attachment; very dark brown patches near the tips of the two upper wings; black patches on the light brown parts and white patches on the dark brown parts.

NOTES—It has keener sight and more rapid flight than the Red Admiral, thus making it more difficult to observe at close quarters. Entomological name is "Pyrameis Gonerilla."

THE DAY-FLYING MOTH

DESCRIPTION—Also called the "Ragwort Moth." Because of its large size and appearance, it is frequently miscalled a butterfly. **Wings,** black and white with dark brown shades near attachment to the body. **Body,** black, with golden bars, parallel to the head. **Antennæ,** like two strands of a small feather. (See illustration, p. 13.)

CYCLE—Female moth lays her eggs usually at the base of the stem of a ragwort plant. The caterpillar which emerges from the egg is covered with tufts of short black hairs, and usually has the same golden bars on its body as the moth. It is frequently called by scholars "the woolly bear" caterpillar.

The **pupæ** can easily be recognized by their glossy black skins, and the small white cocoons in which they are almost hidden.

NOTES—Observe the position of the wings when the insect is at rest. The food of the "woolly bear" caterpillars includes the leaves of ragwort, cinerarias and groundsel.

THE GIANT HAWK MOTH

DESCRIPTION—Also called the "Sphinx Moth." The largest of the common moths found in New Zealand. The two **larger wings** are grey, speckled with a darker shade of the same colour. The two **lower wings** are greyish black with two bands of a paler shade on each wing, one near the outer edge, and the other parallel to it at a distance of approximately a quarter of an inch. When full grown, the moth has a width of $3\frac{1}{2}$ inches from wing tip to wing tip. Its **body** is very stout, greyish in colour with stripes on the sides of rose colour, black and white. **Antennæ** become thicker towards the outward ends, the tips of each terminating in a hook (see p. 9).

HABITS—The moth feeds at dusk. Whilst hovering over a flower it pushes its enormous proboscis into the nectary to extract the honey whilst remaining poised in the air. Its flight from flower to flower is very rapid.

CYCLE—Female moth lays eggs near or upon some part of a plant of the convolvulus family, including the kumara. The **caterpillars,** hatched from these eggs, feed on the leaves, and soon grow to a huge size—from 3 to $3\frac{1}{2}$ inches long. Some-

times the whole of the foliage of a plot of kumaras has been destroyed by them, and it is therefore known as the kumara grub. The caterpillar can be distinguished from other large caterpillars by the curved horn on the top of the last segment of its body. The Maoris consider it as one of their worst enemies and call it "ho-te-te." Towards the end of February the caterpillars go underground and change into **pupæ**—dark mahogany in colour and about two inches long. They are easily recognized by their unusual size, and by the curved "process" which projects from the lower side of the head. The full-grown insect emerges from its pupa case early in the following summer.

THE PURIRI MOTH

DESCRIPTION—Also called the "Giant Swift Moth" and the "Ghost Moth." **Body,** dull green near head, remainder dark cream or buff colour and downy. **Size,** the second largest of the common moths, measuring about three inches from wing tip to wing tip and 1½ inches from head to tail. **Wings:** Its upper wings are light green, each having a band of cream-coloured marks running almost parallel to the edges of the wings. The lower wings are cream coloured, tinged with green near the tips. (Illustration, p. 29.)

NOTES—It is a night-flier and is usually in the bush. Occasionally it visits gardens containing native trees, and is found in a dazed condition at the base of a street lamp standard. The grubs are wood-borers, making their way into the trunks of forest trees, chiefly those of the puriri and wine-

berry. The moth has a very rapid flight. (See alternative name.) Entomological name is "Hepialus Virescens."

THE MOSQUITO

DESCRIPTION—**Body,** thin with six long legs. **Wings,** only two, gauzy. **Antennæ,** those of the female are short with a long sucker tube between them; those of the male resemble those of a moth. (See p. 13.) **Humming noise:** This is caused by the rapid vibration of the antennæ of the male mosquito, but it is the quieter female that bites and sucks the blood.

CYCLE—Female mosquito lays its eggs in a cluster on surface of stagnant water. The well-known **"wrigglers"** emerge. The body of the "wriggler" has nine or ten bulb-shaped segments of which the one next to the head is the largest. The breathing apparatus is in the wriggler's bifurcated tail. The creature frequently comes to the surface of the water to breathe, and its position is then peculiar, the heavy part of its body being downwards, and the tip of its tail just above the water surface. The wrigglers gradually change to **"tumblers"** with much bigger heads, each having two small breathing tubes placed like ears at the two sides of the head. After seven or eight days the "tumbler" becomes inactive and floats on the water, and two or three days later the full-grown mosquito drags itself out of the skin of the "tumbler." Hence "wrigglers" are the larvæ and "tumblers" are the pupæ of these insects. (Illustration, p. 29.)

NOTES—Dragonflies and birds devour large quantities of mosquito eggs and "tumblers." This explains the well-known habit of skimming over the surface of lakes, swamps, and stagnant water by dragonflies and some birds. The position of the breathing apparatus of the "wrigglers" makes it possible to destroy immense numbers of them by pouring kerosene on the water in which they are living, thus choking them by closing the breathing tubes.

THE ROSE APHIS

DESCRIPTION—Also called the "Green Aphis," the "Green Fly," and "Ant-cows." Infest rose bushes in large numbers just before the rosebuds are due to open. They are so small that a hand magnifier or lens is needed to make an individual examination. **Body,** green colour, with four imperfect wings; two bright black eyes that stick out from the sides of its head. **Antennæ**, long and always moving, and between them is placed the short sucker which is almost constantly buried in soft plant growth—petal of bud, leaf or tender stem—from which it sucks all the juices. (See illustration, p. 13.)

CYCLE—The first brood hatch out in early spring from small eggs laid at the bases of leaf buds during the previous autumn. This is the only brood that emerges from eggs. Future broods are born in such quick succession that during the summer months a dozen "aphides" will multiply into thousands, thus causing widespread destruction to twigs and buds.

ENEMIES—Birds, large flies and beetles all kill aphides as food, the little Silver-eye being particularly fond of them and also of "Lady Birds."

NOTES—Other well-known species of "Aphides" are the **"Apple Aphis"** (also called the "Woolly Aphis"), the **"Pear Aphis"** (dark brown), the **"Bean Aphis"** (also called the "Black Aphis"), and the **"Frog Aphis"** (also called the "Jumping Aphis"). The "Frog Aphis" is frequently found amongst the foliage of ivy and Virginia creeper, and may be recognised by its characteristic frog-like hops. The aphis changes the leaf sap into sweet juice, and sometimes drops of this may be seen on the ends of two small tubes on the insect's back. Ants are sometimes seen taking these drops of honey-sweet juice from the Aphides. The ant makes a stroking movement with two of its legs on the sides of the Aphis, which encourages the insect to exude more honey drops. Hence, the Aphis is sometimes called the "Ant-cow."

THE DRAGON FLY

SPECIES—The three kinds most common in New Zealand: (1) The largest, black and gold colour, thin body (see illustration); (2) much smaller, scarlet colour, thicker body; (3) similar size to (2), but peacock green colour. (Illustrations, pp. 13, 29.)

FOOD—(1) Small insects, which they catch on the wing or on grass stems, etc.; (2) eggs of insects, especially those of the mosquito, which they find floating in clusters on stagnant water; (3) pupæ of water insects which they find either

on the surface of water or in damp ground around the edges of it; (4) young sandflies.

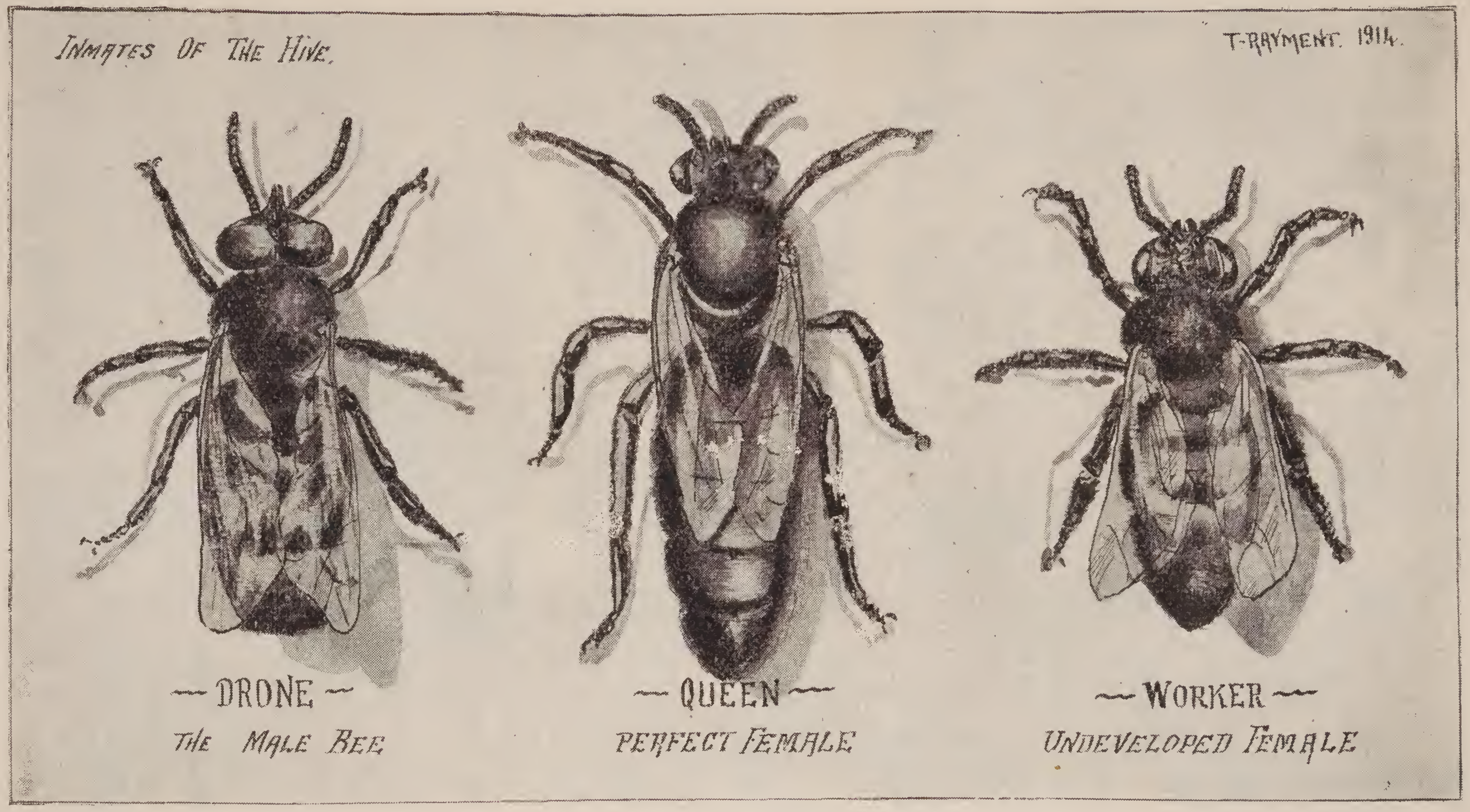
CYCLE—Female insect lays its eggs on the water in sunny weather. The **grubs** which emerge from them live among the water weeds, especially in swamps. They have long bodies, six legs and bulging eyes. The **pupæ** are found on the stems of reeds, rushes or raupo. The **Dragon Flies** emerge from the skins of these, leaving the skeletons sticking to the stems. These empty "shells" are, therefore, easily found in swamp districts.

NOTES—Trout eat a great many—both the grubs and young insects. Dragon Flies are sometimes miscalled "horse-stingers." None of them can sting. They are not only harmless, but are beautiful and useful insects. (See Food.) The mental attitude of most children towards them is the direct opposite to what it should be. Knowledge will correct this.

THE HUMBLE BEE

DESCRIPTION — Also called "Bumble-bee." Much larger and thicker body than the honey-bee. Some are almost entirely **black**; others have golden **yellow bars** across their backs and sides; a third kind is all black except for a **patch of red** at the end of the body.

HABITS—They sleep during the winter in holes usually made in sloping ground such as that usually found below a tall hedge. In early spring the queen bee makes a number of cells of a tough material of a dirty brown colour.



The Honey Bee.

CYCLE—The queen lays her eggs in the cells, and feeds the **maggots** which hatch from these eggs. In 15 or 16 days they change to dark brown **pupæ,** still remaining in their respective cells. Young Humble Bees emerge from the pupæ skins in late spring.

NOTES—Humble Bees do not receive the respectful consideration which is their due. They are extremely useful insects to the dairy farmer, and, therefore, should not be molested or destroyed. They probably carry out more than half of the pollination of the clovers which are so necessary for good pasture paddocks and hay paddocks.

THE STICK INSECT

DESCRIPTION—Long, thin body, 3 to 4½ inches in length, resembling a piece of stick or straw—usually the same colour as the twigs of the shrub or tree amongst which it is found. The colour of the insect changes in autumn in keeping with the changes of the decaying leaves. It has long legs but no wings.

HABITS—Both when at rest and when moving, its long front legs are held straight forward in front of its head, being used as feelers. When disturbed, it drops to the ground and remains quite still, apparently lifeless, and so indistinguishable from a broken piece of twig. It sheds its skin several times.

FOOD—The leaves of shrubs and trees, also the tender bark of stems.

CYCLE—The female insect lays its eggs anywhere, allowing them to fall to the ground, where

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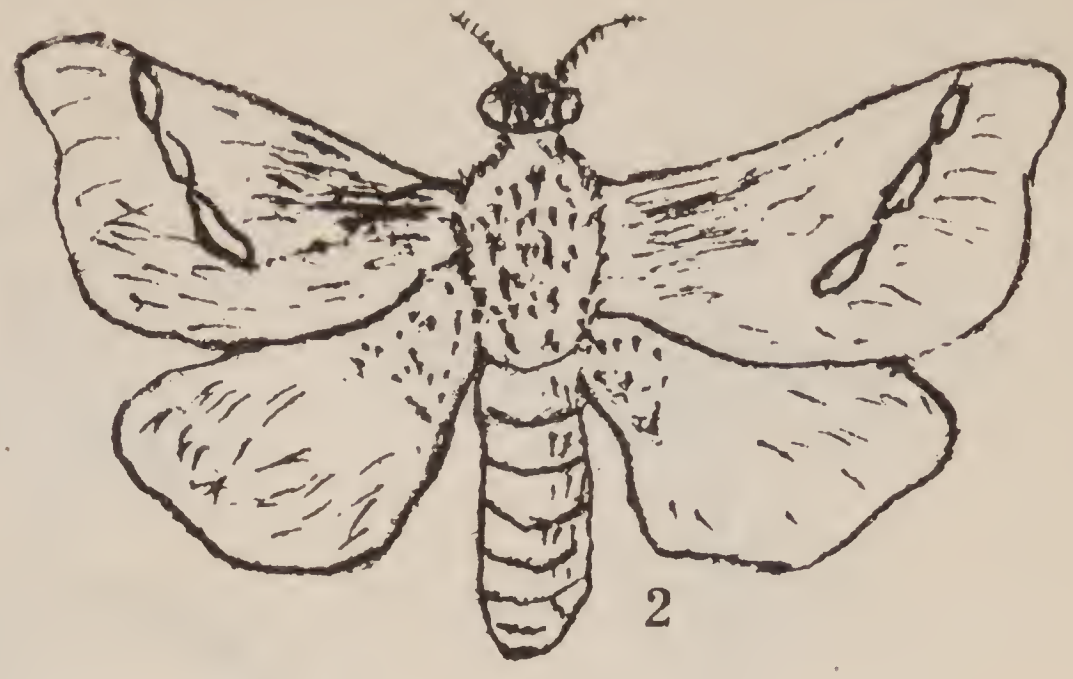

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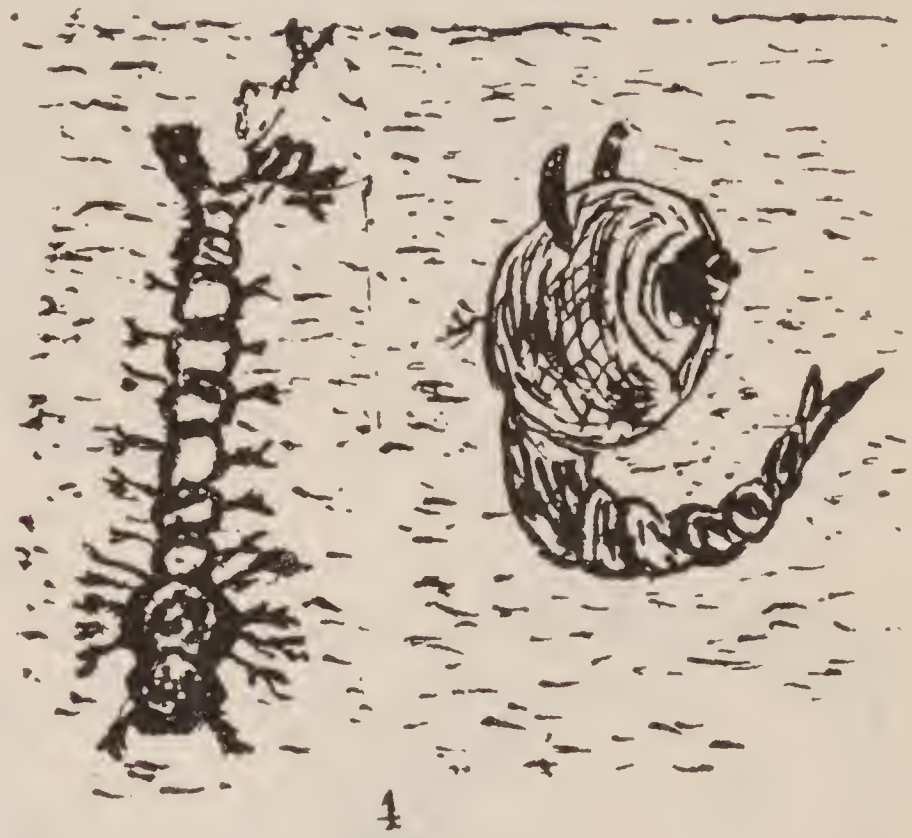

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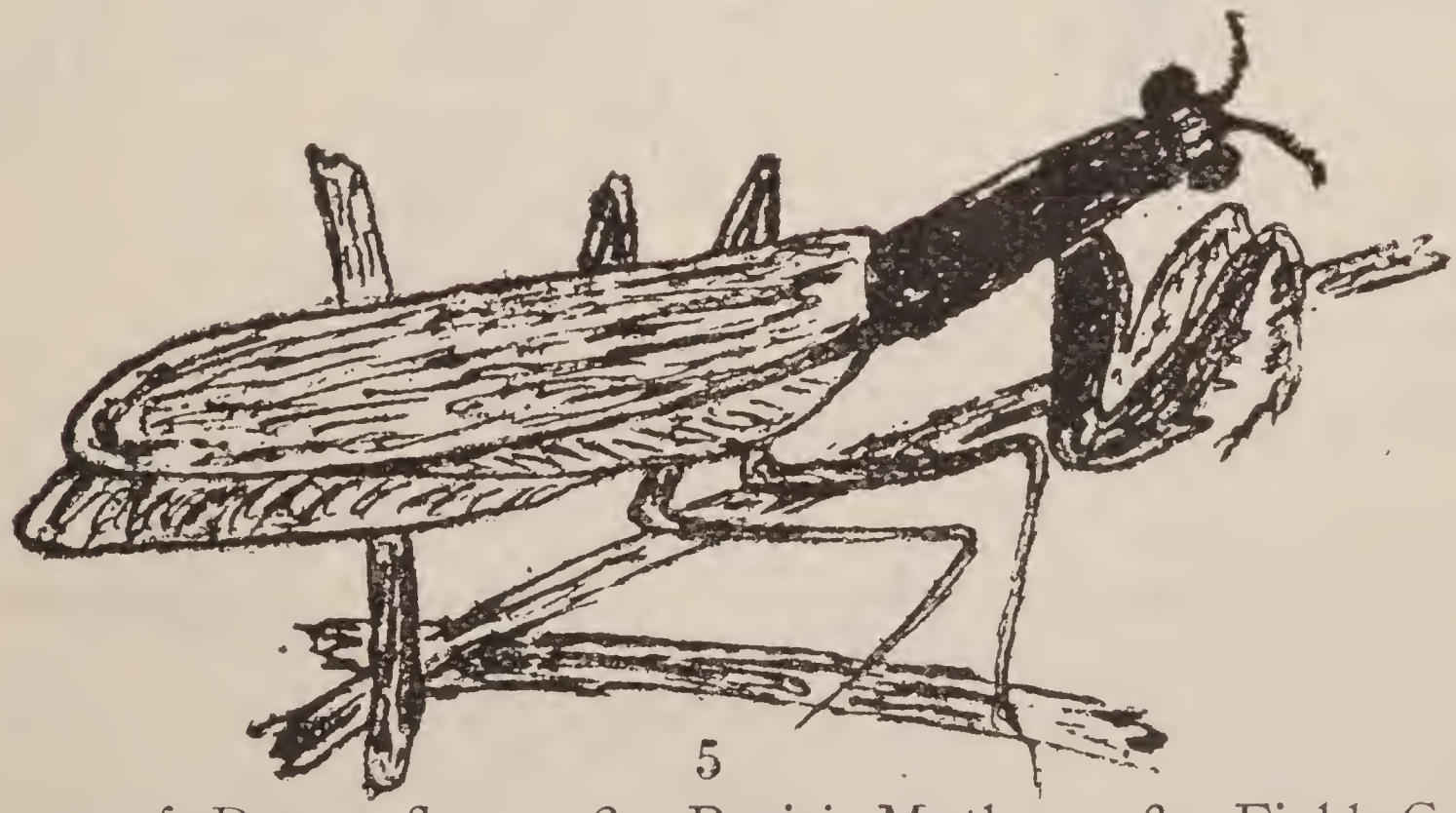

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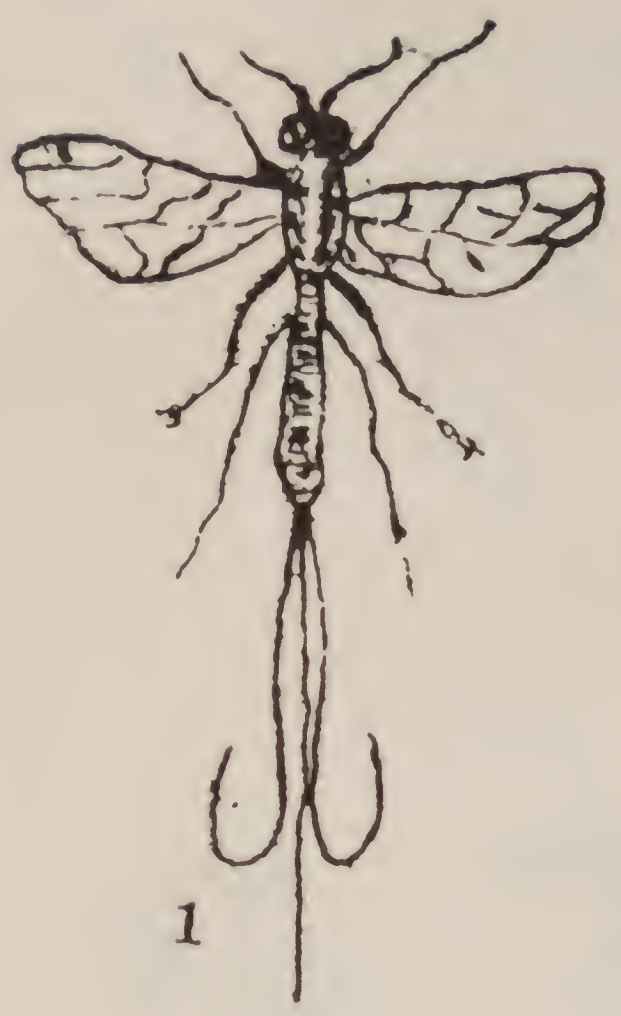
1.—Pupa of Dragonfly. 2.—Puriri Moth. 3.—Field Cricket. 4.—Larva and Pupa of Mosquito—"Wriggler" and "Tumbler." 5.—Mantis, showing posture when looking for "prey." Nos. 2 and 3 are two-thirds life size—others life size.



1

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1.—Ichneumon Fly. 2.—Giraffe Beetle. 3.—Weta.
4.—Mason Bee. 5.—White Butterfly, larva and pupa.
1 and 4 life size, others two-thirds life size.

they hatch, unless destroyed by the trampling of other living creatures. Each egg is like a small pea with a lid on top of it. In nine or ten days a young Stick Insect emerges from under the lid, and is much more active than the full-grown insect.

THE NEW ZEALAND GLOW WORM

DESCRIPTION—It is not a worm but a grub which comes from one of the eggs of a two-winged fly. Each **grub** weaves a little web of a slimy, sticky, thread-like substance which comes out of its mouth. The grub rests on its web, which is usually suspended from a rock. It has an "organ" at the end of its body which gives out a bright light. It can light its "lamp" or extinguish it whenever it chooses.

HABITS—The slightest noise or other disturbance causes it to stop the glow and glide into a hole near the edge of its web. Visitors to the glow-worm cave at Waitomo are conveyed in a boat which is moved by means of an overhead rope in order to minimise the sound, and visitors are previously warned not to talk or make any noise. The roof of the cave is almost covered with webs containing the shining grubs. They are numerous in other places in New Zealand, e.g., the Otira Gorge and on the walls of one of the warm baths at Okoroire.

CYCLE—The grub changes to dark-coloured **pupa**, which also has a "lamp," but somewhat dimmer than that of the grub. The two-winged insect which emerges from the "shell" of the pupa

also has a shining tail, but the light is even dimmer than that of the pupa.

NOTES—The flies always frequent damp, rocky places, and lay their eggs in the rock crevices. The glow-worms in England (Kew Gardens and elsewhere) and in other countries of Europe are grubs from the eggs of a large brown beetle and are found in comparatively dry surroundings.

THE HU-HU BEETLE

DESCRIPTION—Very large, about two inches long and nearly half an inch broad. Medium **brown colour.** Protruding eyes. Its two large upper wings are marked off into small four-sided figures by depression lines which run lengthwise and crosswise over the whole surfaces. **Antennæ,** nearly as long as the body and held near the sides of the wings when at rest. (See illustration on cover.)

HABITS—Hides and rests in trees or shrubs during the day-time; feeds at night. If by any chance the beetle is overturned on its back, it cannot get up on account of the weight of its large body pressing on its wings.

CYCLE—Female beetle lays her eggs in crevice on tree trunk or under the bark. Creamy white **grubs** with powerful jaws emerge from the eggs and become tree **borers.** The 13 segments of the grub are telescopic. After boring into the tree for five inches or more, it scoops out an egg-shaped cavity in which it sheds its skin two or three times, taking about five weeks to become a beetle. It then makes its way out of the tree, living for a few days only as a mature beetle.

NOTES—Hu-hu Beetles have a very keen sense of smell, and are most numerous in December and January. The grubs when in their plumpest state have frequently been used as food by the Maoris, who usually toasted them on a string of flax over an open fire. They are also good fishing bait.

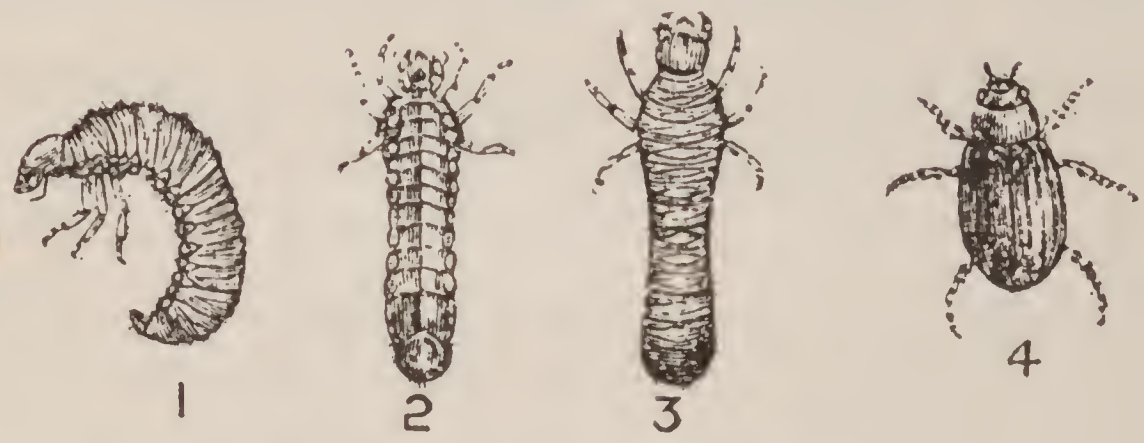
THE GRASS GRUB BEETLE

DESCRIPTION—Also called the Copper-brown Beetle. It has a darker brown margin on its hard **wing cases.** It has no hairs except along the sides of its body and an erect fringe just behind the head. Its **body** is broader at hind end than near the head. There are several minute depressions and narrow smooth lines on the **wing cases.** There are two other brown beetles of somewhat similar appearance in New Zealand, viz., the Bronze Beetle (which is about the same size, but is a day-flier) and the Hairy Brown Beetle (which is larger and has a body completely hairy). Neither of these has the same markings on wing cases as given above.

FOOD—Tender leaves of plants, especially those of broad beans, fruit trees and ornamental shrubs. It is one of the worst New Zealand insect pests.

HABITS—During the day the beetles shelter in dense foliage of tree or shrub, or just beneath the surface of the ground under these. Hundreds can be captured and destroyed (by burning) in a few minutes during a sunny day at any place where they are known to have been at their destructive feeding during the previous night, as they are quite inactive until after sunset. Their humming flight at dusk is well known to orchardists and gardeners.

CYCLE—Female beetle lays small, white, globular eggs on the ground in grass land. Ten days later young **grubs** emerge and commence to eat the grass roots, soon producing brown patches of dead grass on lawn or in paddock. During winter most of the grubs have ceased feeding and are living from 9 to 15 inches below the surface of the



Grass Grub *(Odontria Zealandica).*

1. Larva, side view. 2. The same from below. 3. The same from above. 4. Adult beetle. All natural size. From nature.

ground, recommencing their depredations early in August. The **grub** is creamy white with brownish head, and when not feeding lies doubled up in the shape of the letter U. The **pupa** stage commences early in October, the pupa case being at first creamy white, but soon changing to brownish pink. The **beetles** commence to emerge from pupæ in the same month, and live for three or four weeks. Starlings clear the farms of tens of thousands of the grubs during summer and autumn seasons. (See p. 52.) The grass grub is sometimes confused with the larva of the Tiger Beetle, called by children "Butcher Boy" or "Penny Doctor." This has the typical six legs like the grass grub, but lives in a burrow and has a horn-shaped projection on its back.

All three flying beetles described on p. 33 have similar habits, but they can be distinguished from one another by careful examination. Swarms of the Hairy Brown Beetles are on the wing, at dusk and later, for a few weeks before the Grass Grub Beetles appear, and are frequently mistaken for these.

THE WETA

DESCRIPTION—The two species most frequently seen are the Cave Weta and the Tree Weta, of which the latter is the larger. It is glossy yellowish-brown in colour, the head of the male being dark brown above and black below its powerful jaws. Its **head,** with its bulging eyes and jaws like an eagle's beak, is its most distinctive feature. Its **antennæ** are very long and are usually held near its sides or over its back, extending a short distance beyond the end of its body. The **back legs** have numerous spurs which the male Wetas bring into full use when fighting one another. Like the Mantis, the Weta has its **ears** on the inside covering of its front legs, and they can be distinguished by two small black patches (see p. 30).

HABITS—Wetas feed only at night time. The males attract their mates by a strange scratchy sound, produced by scraping their legs along their sides. They frequently fight, and when doing so present a most amusing sight, as they bring their long spurred hind legs over their backs and above their heads. Climbs well, often found in highest branches of trees.

FOOD—Chiefly the edges of the leaves of shrubs. Do very little damage, except to tall tea-tree, kamahi and mahoe.

CYCLE—No grub or pupa stage. Female Weta lays about 50 small oval-shaped eggs, and young Wetas hatch out of these.

NOTES—This insect has three pairs of jaws. These do not move up and down, but laterally, having a cutting action similar to that of a pair of scissors or garden secateurs. Consequently a bite from the insect is distinctly noticeable.

THE COMMON LOCUST

DESCRIPTION—A large insect, sometimes nearly two inches long. The colours of its **body** are mixtures of pale greens and light browns. Its **eyes** are oval and rather prominent. **Antennæ** are comparatively short, less than an inch long. All six **legs** end in sharp claws, and there are clear, dark blue blotches on the inside of the end pair near the top (see p. 13).

HABITS—It can spring long distances, and when in flight some of its legs are dangling down. (Cf. the flight of a stork.)

FOOD—Young grass, tender plants and grass seeds. Causes great loss in South Africa, Egypt and some other countries where a host of locusts frequently eats every shoot of a crop of young rice, wheat, maize, etc. The natives light fires, beat drums or kerosene tins, and make hideous noises to prevent the locusts from alighting on their crops.

CYCLE—The mother locust commences to lay eggs in May, boring holes in the earth with her strong ovipositor and laying a few eggs in each, until about 60 eggs in all have been laid. These do not hatch until nearly four months later, when the young locusts crawl out.

NOTES—The natives of Australia and some parts of Africa use locusts as food, usually frying them in fat. Another species, not quite so common in New Zealand, is called the "Tree Locust." It is found in trees, or in the grass under trees, and is difficult to distinguish on account of its "all-green" colour. It is frequently miscalled a grasshopper.

THE GRASS-HOPPER

DESCRIPTION—It is much less in size than the common locust, but having similarly shaped hind legs, it is also able to hop long distances. Its **head** is green and somewhat similar to that of the Mantis, but on a much smaller neck. Its **antennæ** are much longer than those of the Locust, being sometimes more than two inches long. The under part of its **body** is barred green and light brown, and there are three hair-like protuberances jutting out from the end of its body.

FOOD—Tender grass shoots and tender leaves, also the bark of tender stems.

NOTES—It is a very pretty insect, especially when viewed through a magnifier.

THE CRICKET

DESCRIPTION—There are several species, the one most frequently seen in New Zealand being almost entirely black in colour. Its front **legs** are stronger than those of the Grasshopper. With their aid it makes the holes in the ground in which it hides during most of the day. Its **antennæ** are of medium length, being longer than those of the Locust, but shorter than those of the Grass-hopper. It has four wings which it seldom uses, and which are absent from young Crickets.

HABITS—It makes "chirruping" noises at short intervals, usually in the afternoon and until long after sunset. On a fine star-light night, the continuous "chirrup, chirrup" of the Crickets is almost as incessant as the "zooming" noises of the Cicadas in the daytime.

FOOD—Tender bark of the stems, and also the leaves of plants, shrubs and young trees.

CYCLE—Neither grub nor pupa stage. Female Cricket makes a hole in the ground which ends in a short tunnel. She lays her eggs at the end of this tunnel, and the young Crickets hatch out of them some months later.

NOTES—The Cricket is considered a pest by the gardener and the orchardist. (See Food.) Crickets have become so numerous in many districts that they have extended their ravages to the foliage of such crops as runner beans and tomatoes. (Illustration p. 29.)

LADY BIRDS

DESCRIPTION—There are many species, the two usually seen in New Zealand being the **"red and black"** Lady Bird and the **"all green"** Lady Bird—sometimes called the "Manuka Beetle." There is also a **blue** Lady Bird which is fairly common in fruit-growing districts. They are small cockchafer **Beetles.** The first kind has red wing cases with black spots. These cases cover a pair of small thin flying wings. The green Lady Bird is slightly smaller in size, and is nearly always found in manuka or tea-tree bushes.

FOOD—The **red and black** Lady Bird is a parasite insect which does much good by eating rose aphides (green fly), scale insects and other tiny insect pests. The **blue** Lady Bird is also a useful parasite insect, destroying the scale insects on lemon trees. The **green** Lady Bird, however, is itself a pest, as it eats the leaves of tea-tree and other small-leaf bushes.

NOTE—Large numbers are eaten by small birds, the Silver-eye being particularly fond of them.

THE CRANE-FLY

DESCRIPTION—Also called **"Daddy Longlegs."** Like the Mosquito, it has only two **wings,** both of which are gauzy. They are very beautiful, especially when examined under a magnifier. Its six legs are very long in proportion to its small, thin body; hence alternative name.

CYCLE—The female lays her eggs about a quarter of an inch below the surface of the ground.

It makes the holes by a twisting movement of its gimlet-shaped ovipositor, and lays a batch of eggs in each hole until about 250 have been deposited. The dirty-looking grubs known as "Leather-jackets" hatch from the eggs, and are well-known pests to the farmer. Like the Grass Grub, they do enormous damage to new grass land, and also eat young turnip plants, etc.—both the finer roots and also the tender young leaves. The Leather-jacket is often confused with the larva of the Click Beetle. This larva is the well-known "Wire Worm," which has a similar life history and does the same kind of damage to plants as the Leather-jacket. The Wire Worm, however, is a "grub," whereas the Leather-jacket is a "maggot." (See p. 9.)

NOTES—The campaign against the spread of the White Butterfly might with benefit be extended to the more easily caught "Daddy Longlegs." Many "Leather-jackets" continue their destructive feeding on roots and young plants for two or three years before they change to the pupa stage.

THE HOVER-FLY AND DRONE-FLY

DESCRIPTION—Often mistaken for bees, as they make a similar humming noise when hovering near flowers. The Hover-fly has black and gold bars running lengthwise on the top of the middle part of its body. Its **head** is larger than that of the Humble Bee, being wider than its chest. The hindmost part of its body is bluish black and somewhat glossy. The Drone-fly is not so conspicuous,

being almost entirely of a dark brown colour. (See illustration, p. 13.)

FOOD—The nectar of insignificant flowers and of flowers which have an unpleasant smell, e.g., flowers of the ivy and of some of the hedge shrubs. Bees do not visit these, and so they depend chiefly upon these flies for their pollination.

NOTES—They are more rapid in flight than the bees, but their "hum" is not so loud. They are also useful in the larva stage, as the grubs devour aphides, especially those which destroy bean plants (the black aphis).

THE GIRAFFE BEETLE

This is one of Nature's strange-looking creatures and a glance at its neck, as represented in the illustration on p. 30, will show the appropriate significance of its name. From being somewhat rare ten years ago—and at that time rarely seen away from the thick bush country—it has gradually become fairly common. This is probably due to its liking for the tender young leaves of the silver birch tree, and the fact that this tree has become increasingly popular for planting near boundary fences and also for other decorative purposes. The beetle frequently lays its eggs under the bark of the silver birch, placing them in this position by means of its strong ovipositor.

PART II.—BIRDS

INTRODUCTORY NOTES

The descriptions are of the male birds. The **songs** are represented approximately: it is often impossible to do so more exactly, as the intervals between successive notes introduce quarter tones, or even less differences of pitch. The closest approximation can be obtained by whistling the notes given for each bird, an octave, or, if possible, two octaves higher than their vocal pitch. Birds' **eggs** can be collected without cruelty if carefully done, from nests which contain more than three; but it is illegal to take any eggs from the nests of native birds (e.g., the Tui and the Bell Bird) or from the nest of the Starling. **Nests** should not be collected earlier than the month of April. It is impossible to view some of the smaller adult birds for more than a few seconds at a time on account of their shyness. For "lesson" purposes this short examination can be supplemented by a large picture or coloured blackboard sketch. **Godwits** collect on the shores of Parengarenga Harbour, North Auckland, and leave New Zealand in the months of February and March for Siberia, their homeland. The **Cuckoos** also leave New Zealand at this time. flying to the Solomon Islands and neighbouring Pacific islands. Young Cuckoos do not leave until April, and some of the late-hatched remain in New Zealand until the following summer before migrating. This accounts for Cuckoos being seen here occasionally in the winter. All the migrants return to New Zealand in the middle of September.

Most of the smaller birds, including the Fantail, Yellow Hammer, Goldfinch, White Eye, and Grey Warbler, migrate periodically within New Zealand, usually travelling northwards as cold weather approaches, and southward during the spring months. As the particular food of the birds—insects and grubs for some, seeds for others—becomes insufficient, they move to the adjacent district that has a larger supply. Those who have listened to the medley of sweet sounds with which our feathered songsters welcome the dawn, and have been able to analyse the commingling of melodies, detecting the dominant notes of the Thrush, the liquid contralto of the Blackbird, the silvery trills of the Grey Warbler, etc., or have had a similar experience when in or near the New Zealand "bush," will know what a great pleasure this brings. It is in the hope that this delightful experience may become more general that an attempt has been made in this book to supply the songs of the birds described. My itinerant work has given me exceptional opportunities for observation of bird life, especially in the bush country on the shores of Kawhia Harbour and Lake Rotoiti, and in the Waitangaru and Waingaro Valleys.

BIRDS' EGGS

SIZE (compared with Blackbird's eggs):—
* larger; ** twice the size; † about the same size;
— less; —* much less, tiny.

COLOUR—**1 to 9,** white; **10 to 18, and sometimes 31,** whitish; **19 to 22, and sometimes 24,** blue or

green, no marks; **23 to 26,** blue, with marks; **27 to 31,** other colours.

(1) **Kiwi:** *** duck's egg ($\frac{1}{4}$ weight of adult Kiwi), white, no marks.

(2) **Wood Pigeon:** Same size as small pullet's egg, white, no marks.

(3) **Kingfisher:** (*), white, no marks or spots.

(4) **Shag:** Same size as hen's egg, white, sometimes bluish tinge, no marks.

(5) **Tui:** (†), white, sometimes with brownish red spots at one end.

(6) **Greenfinch:** (—), white or pale grey, with small brown spots at broad end.

(7) **Tom-tit:** (—), white, speckled with greyish-red spots.

(8) **Fantail:** (—), white, with brownish-grey spots at both ends.

(9) **Fernbird:** (—*), white, speckled with grey and purple marks.

(10) **Californian Quail:** (*), creamy white, broad and pear-shaped, olive brown spots.

(11) **House Sparrow:** (—), pale grey, sometimes with brown and dark grey spots.

(12) **Yellow Bunting:** (—), pale grey with purplish tinge, also brown spots and streaks.

(13) **Ground Lark:** (—), pale grey, with greyish-brown marks.

(14) **Linnet:** (—), pale grey, with greenish tinge, also reddish-brown spots and streaks.

(15) **Pipit:** (—), pale grey, speckled with greyish-brown marks.

(16) **Goldfinch:** (—*), bluish-white, with brown spots mostly near broad end.

(17) **Bellbird:** (†), pinkish-white, with reddish-brown spots.

(18) **White Eye:** (—), bluish-white, no marks.

(19) **Starling:** (†), medium blue, no marks.

(20) **Myna:** (†), medium blue, glossy, no marks.

(21) **Hedge Sparrow:** (—), turquoise blue, no marks.

(22) **Shining Cuckoo:** (†), olive green, no marks.

(23) **Blackbird:** Greenish-blue, almost covered with reddish-brown and grey spots.

(24) **Thrush:** (†), blue, with large black spots at broad end, sometimes none.

(25) **Redpoll:** (—), pale greenish-blue with orange-red spots at broad end.

(26) **Chaffinch:** (—), pale greenish-blue, with reddish-brown marks.

(27) **Pukeko:** (*), greyish-brown, with mauve marks and clots.

(28) **Skylark:** (—), greyish-brown, almost covered with brown spots.

(29) **Long-tailed Cuckoo:** (†), cream, with numerous brown spots.

(30) **Sparrow Hawk:** (**), cream, but almost covered by dark brick-red clots.

(31) **Grey Warbler:** (—*), light pink, sometimes white, usually with tiny red spots, but sometimes none.

BIRDS' NESTS

(Approximately in order of excellence of structure.)

Grey Warbler: Hairs, spiders' webs and soft moss, closely woven together and lined inside with feathers. Opening is at the side.

Goldfinch: Thin twigs, fibres and moss, lined inside with a mixture of hair, wool and feathers; saucer-shaped.

Chaffinch: Fine twigs and fibres well woven together, lined inside with hair and outside with moss and decayed leaves.

Fantail: Light pieces of rotten wood, lined inside with hair and outside with moss.

Redpoll: Small stems, twigs, moss, with very good inside lining of soft down, hair and feathers.

White Eye: Fibres and hair, lined outside with moss.

Bell Bird: Twigs and moss, lined inside with feathers.

Fern-Bird: Dried grass and root fibres, with outer layers of cutty grass, and inside partly lined with feathers (curly tops upward); cup-shaped.

Greenfinch: Roots, wool and moss, lined with wool, hairs and sometimes with a few feathers.

Chaffinch: Dried grass, fibrous roots and feathers, all intertwined.

Pied Tit (Tom-tit): Dried grass, fibrous roots and feathers, all intertwined, but slightly smaller nest than above-mentioned.

Thrush: Straw and dried grass, good shape and lined inside with mud or clay.

Tui: Fibres and thread-like roots, lined inside with dry grass and edged with manuka twigs; plate shaped.

House Sparrow: Roughly made of dry grass, rags, straw and feathers.

Skylark: Mixture of dry grass and feathers (on the ground).

Blackbird: Root fibres and dried grass, no lining.

Starling: Roughly made of straw (or dry grass) and a few feathers.

Myna: Roughly made of straw (or dry grass) and a few feathers.

Pipit: Soft dried grass (on ground or in a tussock).

Shag: Dry grass, rushes, twigs, and coarse moss.

Yellow Hammer: Coarse dry grass only.

Kingfisher: A hole in a dead tree or sloping ground lined with dry grass.

Pukeko: Dry rushes lined with soft grass.

New Zealand Pipit (Ground Lark): Dried grass and a few feathers.

Wood Pigeon: Saucer-shaped, fine twigs and some coarse moss.

Kiwi: A few twigs in a hollow tree trunk or beneath a fallen tree.

Californian Quail: None. Lays its eggs in a hidden depression on the ground.

SIZES OF BIRDS

Those mentioned in the same line are approximately the same size, but less than those in the preceding line.

1. **Kiwi,** Pukeko (Swamp Hen), Wood Pigeon.
2. **Godwit,** Long-tailed Cuckoo, Bush Hawk.
3. **Tui,** Morepork, N.Z. Thrush, Californian Quail, Blackbird, Kingfisher, Myna.
4. **Thrush,** Starling, Pipit (Ground Lark), Bell-bird.
5. **Skylark,** Shining Cuckoo, Yellow Hammer, Fantail.
6. **Greenfinch,** Chaffinch, House Sparrow, Linnet, Hedge Sparrow.
7. **Goldfinch,** Pied Tit (Tom-tit), White Eye (Blight Bird), Redpoll, Grey Warbler.
8. **Bushwren** (Rifleman).

FOOD OF BIRDS

1. **Nectar of flowers:** Tui, bell-bird, white-eye, grey warbler (shrubs), wood-pigeon (trees).
2. **Insects:** Grey warbler, fantail, myna, tomtit, white-eye, hedge sparrow, starling, cuckoos, bell-bird, redpoll, magpie, chaffinch, kingfisher, thrush.
3. **Larvae:** Tomtit, ground-lark, starling, cuckoos, myna, quail, kingfisher, young goldfinches, blackbird, kiwi, hedge sparrow.
4. **Snails:** Thrush, kingfisher, blackbird.
5. **Young mice and rats:** Owls, hawks, weka, kingfisher.

6. **Edible fruits:** Pigeon, blackbird, greenfinch, sparrow, chaffinch, thrush, myna, tomtit.
7. **Seeds:** Sparrow, redpoll, goldfinch, yellow hammer, quail, greenfinch, chaffinch, wood-pigeon (trees).
8. **Worms:** Thrush, blackbird, kingfisher, kiwi.
9. **Soft shoots:** Pukeko, skylark (grain crops), magpie, yellow hammer, sparrow, quail.
10. **Young birds:** Owls, hawks, shining cuckoo, long-tailed cuckoo, kingfisher.
11. **Fish:** Gannet (diving), tern (surface), shag (swimming under surface), heron (stationary).

Hence, the birds named in groups 1 to 5 are friends of the farmer, orchardist and gardener, modified to some extent, if mentioned in other groups.

THE THRUSH

SONG—

Key F: | d'.t:l.m:— (rep.) | d.m:s:— (rep.) | s.m:— (rep.)

and several other groups of 2, 3 or 4 (occasionally 5) notes, **each group being repeated** 2, 3 or 4 times before change to another group. Sings at all seasons except late summer, commencing at daybreak and preferring a high perch whilst singing—top of telephone wires pole, or summit of a tree, especially favoured. The hours before sunrise and after sunset are its favourite times for song. The New Zealand Thrush—almost extinct—has quite a different song.

FOOD—Worms, snails, insects and succulent fruits, especially blackberries and strawberries.

DESCRIPTION—**Head** and **upper parts,** olive brown. **Underparts,** cream coloured, spotted dark brown, having distinctive speckled breast.

NEST (see pp. 43, 46)—Probably the earliest nest builder of the imported birds. Young Thrushes have been seen away from their nests as early as June. Nesting season, June—December. Builds nest in hedge or sheltered shrub, and lays 4, 5 or 6 eggs.

HABITS—Whilst hopping about the lawn or paddock frequently pauses and holds its head slightly to one side, listening for movement of chance worm, then makes a sudden dart, quickly pulling its victim out of its hole. It breaks the shells of snails on rocks, concrete or any other hard surface conveniently situated for the purpose. It is seldom found in the New Zealand bush or anywhere far from the habitations of men. (Cf. Blackbird).

THE BLACKBIRD

SONG—

Key C: |d.m:d.m|s:—|m.l:—r|s:—|

and several other groups of 5, 6, 7, 8 or 9 notes. The same group is seldom repeated. After finishing one group, the Blackbird pauses for two or three seconds, and then sings another. Its song is **low pitched** and of great **purity of tone.** Two Blackbirds can sometimes be heard imitating each other's song, especially in the New Zealand bush.

DESCRIPTION—**Plumage** black, but not glossy. **Legs,** black. **Beak,** golden yellow. Female bird has dark brownish plumage, somewhat resembling the

Shining Cuckoo

Long-tailed Cuckoo

Godwit

Bellbird and
Silver Eye

North Island
Tom-tit

Fern Bird and
Pipit

female Thrush, but has a longer tail which it flits about on alighting. (See p. 59.)

FOOD—Worms, slugs, grubs and fruit. A great pest to the orchardist.

NEST (See pp. 43, 46)—In bushes, hedges, ledges of rock, trunks of trees, etc. Lays 4, 5 or 6 eggs.

HABITS—Prefers the bush to the haunts of men. Is found in its furthest depths all over New Zealand except north of Whangarei. Only comes near houses when shortage of food in the bush. Usually sings best in October when its notes are the first to be heard at dawn and the last at night-fall in the Auckland district.

THE STARLING

SONG—Various long whistles, very similar to that of a human being, e.g., the **farmer's whistle** for his dog—usually falling gradually in pitch to the extent of three or four tones. After a short pause, this whistle is frequently succeeded by a **guttural click-click sound,** repeated and continued for duration of half-a-minute. The Starling sometimes flutters its wings whilst making this sound.

DESCRIPTION—**Plumage,** glossy black, intermingled with shades of bronze, green and dark purple. **Bill,** lemon yellow in summer and autumn, gradually changing to black in winter.

FOOD—Grubs, insects and fruits, the two former including many of the farmers' pests, e.g., the grass grub which, if not destroyed, changes to the copper-brown beetle, another pest—sheep ticks, and the crane fly (Daddy Longlegs), the eggs of which

hatch out the dirty brown grub known as leather jacket. (See "Grass Grub Beetle" and "Crane Fly," Part I.).

HABITS—Communistic, except at nesting times. May be seen in flocks of hundreds, or even thousands, in remarkable flight, wheeling, rising, falling, opening out, etc., as if obeying the signals of their leaders. Like the Thrush, the Starling is seldom seen very far from the haunts of human beings. It prefers walking to hopping, but does both.

NEST (See pp. 43, 46)—Builds in the oddest places imaginable—letter-box, wash-house chimney, tool-shed (sometimes actually amongst the tools), eaves or chimney of dwelling house.

NOTES—Is much blamed for depredations in the orchards. The U.S. Department of Agriculture has made an exhaustive study of the Starling's food during each month of the year. The contents of "crops" of 2,157 birds were examined, and the results proved that three-quarters of this bird's total food supply consists of weevils and insects, also that in only two months of the year does the quantity of fruit eaten amount to one-tenth of its food and never more than this in any month. In late autumn and winter, each of its feathers has a buff-coloured tip which produces the characteristic speckled appearance of its plumage.

THE MYNA

SONG—Very harsh call on two notes, repeated twice or thrice.

Key C : .s | d' .:.s | d' .:.s | d'

DESCRIPTION—Name sometimes spelt "Myna" and "Minah." **Upper parts,** medium brown and

black. **Neck and breast,** black. **Under parts,** light brown. **Legs,** yellow. **Wings,** white bands on under parts are conspicuous when flying. (See p. 59.)

FOOD—Insects, grubs and fruit, especially fond of young grass-hoppers and locusts. It was brought from India to Australia to reduce the number of these insects, and came thence to New Zealand.

NEST (See pp. 43, 46)—Built roughly in any sheltered place; 4, 5 or 6 eggs.

HABITS—Prefers gardens and orchards rather than life in the bush. Can be taught to talk when in captivity. Sometimes walks, sometimes hops.

THE KINGFISHER

SONG—Harsh calls of two or three notes.

Key D: | 1 . m : | 1 . m : | : f | 1 . m : | . f : 1 . m
Rah-kow Rah-kow O-rah-kow O-ra-kow

DESCRIPTION—Black bill and band of black around neck. **Upper parts,** sea-green with tinge of olive. **Under parts,** brownish white. **Wings and tail,** deep sky blue (parts). Maori name, "Kotare."

HABITS—Seldom seen on the ground. Sits on fences, walls, etc., awaiting its prey. Short, rapid, darting **flight,** often skimming close over water. Feed their young until they are full grown.

FOOD—Fish, small crabs, young birds, young mice and rats, grubs, snails, worms and spiders—choice according to locality in which it has made its home. Many naturalists have testified to its unfortunate liking for young birds, especially white-eyes.

NEST (See pp. 43, 46)—Builds in November or December. Usually 5 eggs.

THE PUKEKO (Swamp Hen).

SONG—A monotone screech, very loud, and lasting two or three seconds. Repeated at short intervals, sometimes every minute, and continued until fairly late at night. The noisiest of the New Zealand birds.

DESCRIPTION—**Head,** dull black with cherry-red eyes. **Breast,** very beautiful indigo blue. **Beak,** red. **Tail,** white feathers underneath. **Legs,** pale red colour.

HABITS—Flits its tail without ceasing, thus showing the white feathers. At evening twilight a number of them may be seen playing a kind of game which consists in running after one another, in and out among the raupo, wings outstretched, for some minutes, concluding with a wild rush and repeated screechings. They bend down and intertwine the raupo leaves, one of them mounting to the summit to screech defiance at the rest. This practice is also carried on in fields of standing corn, oats, etc., thus making the birds unpopular with the farmers. The young birds are "all blacks," but very shy. The parent birds look after them until they are almost as big as themselves. (Cf. young Kiwis).

NEST (See pp. 43, 46)—Built in September among the raupo not far from the water surface.

FOOD—Soft shoots, water weeds and insects, also the grubs and pupae of those insects which lay their eggs in swamps. Sometimes when feed-

ing, it presents a comical appearance by holding its food in one of its feet in a way somewhat similar to that of the parrot. The writer has known large areas of young maize shoots to be devoured in one day by Pukekos, and they have been known to spoil a crop of half-grown field carrots by eating the tops.

THE SKYLARK

SONG—

tr---------- tr----------
Key G | m :—. s | l :— :— (rep.) | f . l . s : m :—|—: (rep.)
tr----------
d' :—. t | s :—|—: (rep.)

and several other groups of two, three or four notes, the last of which is **trilled** and **sustained** for two or three "pulses," each group being repeated once or twice: no pause between successive groups, but a continuous song of sweet, melodious notes—more numerous than those of any other bird in New Zealand. It sings its song whilst ascending slowly and with fluttering wings towards the sky, and continues doing so whilst descending in similar manner, until about fifteen feet from the ground, when it makes a swoop downwards with closed wings, **running** along the ground for a few yards on alighting.

DESCRIPTION—**Head,** whitish-brown. **Upper parts,** streaked with dark brown. **Under parts,** brownish-white, spotted and streaked with dark brown—similar to the thrush. **Legs,** brownish yellow.

FOOD—Grain, seeds, sprouting cereals—hence a great pest to the farmer in cereal-growing districts, also to the market-gardener.

NEST—Built in a hollow on the ground (see pp. 43, 46); 4 or 5 eggs (in November or December).

HABITS—The height to which it soars when singing is usually considerable, but it is noticeable that in New Zealand this is gradually diminishing. It does not hop, but either **runs** or **walks**—usually the former.

THE GOLDFINCH

SONG—Twelve to fifteen notes of equal length, without pause: seldom sings more than two or three times before flying to a new position. Song is more like that of a good canary than is that of any other bird in New Zealand—less notes but same quality.

DESCRIPTION—Easily recognised by its **yellow** and black, also brown and white plumage, with a good number of small **red** feathers near the "bill." **Legs,** flesh-coloured. (See p. 59.)

FOOD—Seeds of both garden flowers and wild flowers—especially fond of the seeds of "cosmos" and broad-leaved "plantain" (ribgrass).

NEST—Built in hedge, bush or small tree. October, November or December. Lays 4, 5 or 6 eggs in it. (See pp. 43, 46.)

HABITS—Flies short distance in a series of swoops. Like the thrush, the Goldfinch prefers elevated positions—a high fence, telephone wires, etc. It is extraordinarily attracted by a caged bird

or birds, and so is easily caught on "limed" twigs when a caged bird is used as a decoy. Haunts gardens, orchards and wayside hedges. Frequently seen clinging to large weeds in various positions and attitudes, whilst eating the seeds.

THE CHAFFINCH

SONGS—Two—the usual chimp, chimp, chimp: : chimp: chimp: on same note throughout, and, during mating season the following:—

Key Eb |r'.re':d'.t|ta.l:se| : |f.f:l.f||

DESCRIPTION—One of the prettiest of small birds. **Upper parts,** yellowish brown. **Breast** (male), chestnut red; female, greyish white. **Wings,** two white bars on each. (See p. 59.)

FOOD—Insects, seeds and food scraps from houses.

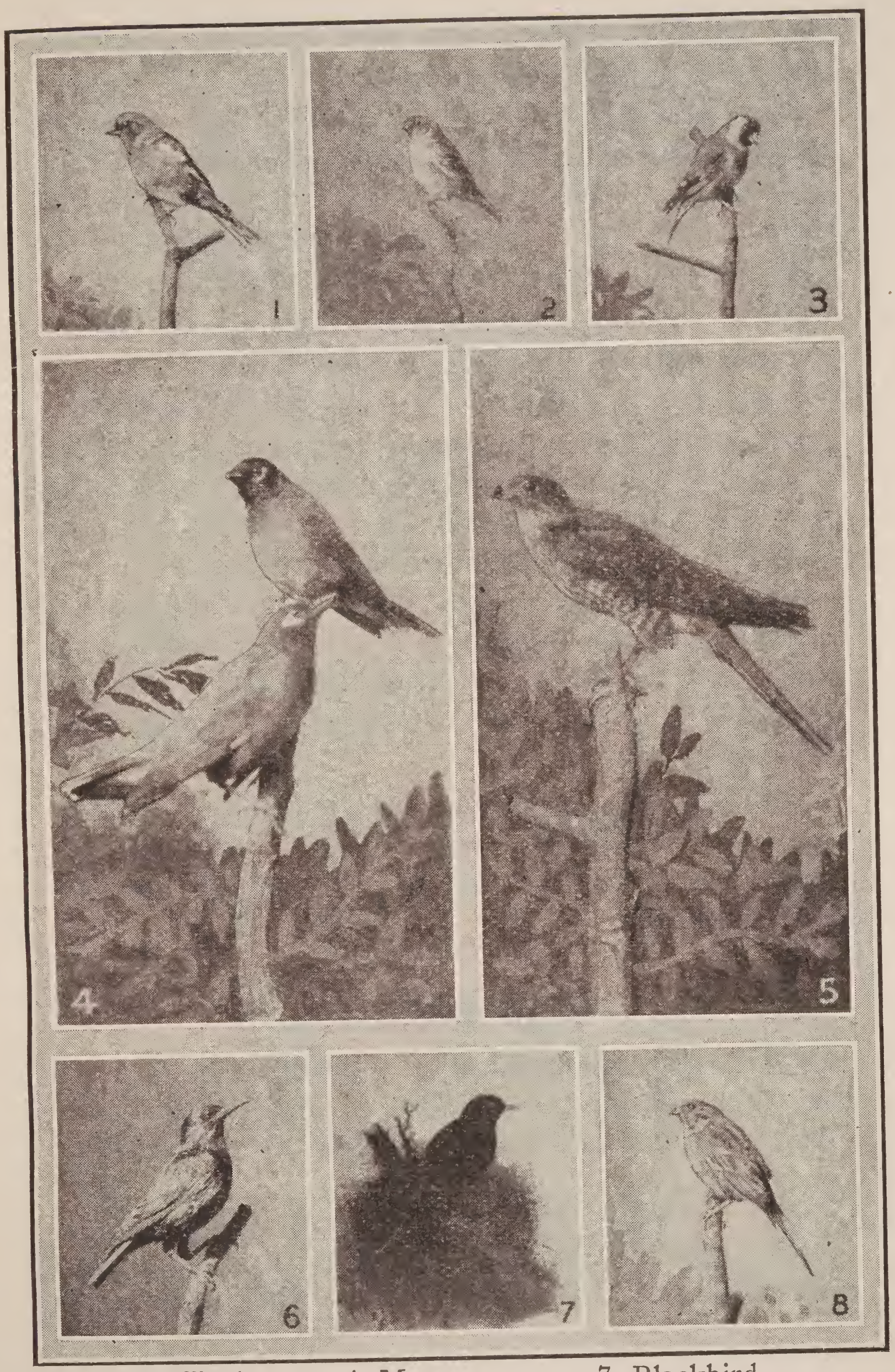
NEST—Built in the fork of a tree or large bush, not very high above the ground, in the months October to December. Lays 4, 5 or 6 eggs in it. (See pp. 43, 46.)

HABITS—Shy and wary: often seen in the company of hedge-sparrows.

THE FANTAIL

SONGS—This bird has two "calls":—tweet: : tweet: : tweet (short, and same note for each), and "catch-a" (with a **rising inflection**—sometimes repeated rapidly 4 or 5 times. Also a short song, as given below:—

Key G: |d.l:s.m|f.r:d|



1. Chaffinch
2. Redpoll
3. Goldfinch
4. Myna
5. Bush Hawk
6. Starling
7. Blackbird
8. Yellow Hammer

very quickly, usually with head lowered—less than two seconds duration.

DESCRIPTION—Also called "Pied Fantail" to distinguish it from the "Black Fantail"—a rare New Zealand bird. **Head,** dull black, with white throat. **Breast,** upper part black; under parts deep yellow. **Tail,** olive brown and white (fan-shaped).

FOOD—Insects, which it catches "on the wing," being helped by long hairs on its "bill."

HABITS—Its flight, resulting from method of getting its food, consists of quick darts and all kinds of aerial evolutions. It frequently follows its prey into house or school. Very friendly bird, but is rarely seen to alight on the ground.

NEST—Like the thrush, it has a very long period of nesting time—August to January inclusive—and builds its nest around a twig, frequently one that overhangs running water. It lays 4 or 5 eggs in it. (See pp. 43, 46.)

NOTES—Among the insects it catches for food are some that are orchard pests, including the "codlin moth"—the worst of all pests in the pip-fruit orchard.

THE TOMTIT

SONG—Somewhat similar to one of the songs of the "Grey Warbler," but not so loud. Every note, except the first and last, is "trilled" or "warbled."

tr----------

Key G: .s | d' : ta | l : se | l : se | l : se | l

DESCRIPTION—Maori name is "Miromiro," also called the "Pied Tit," and the "White-breasted

Tit." One of the "Warbler" family, which also includes the Grey Warbler and the Hedge Sparrow. **Head** and **upper parts,** black, with white spot above the "bill." **Breast,** white. **Wings,** black and white. **Tail,** black. (Illustration, p. 51).

FOOD—Insects and soft fruits.

NEST—It is built somewhat low down in the fork of a tree or large bush. It has a short nesting season—November and December. (See pp. 43, 46.) 4 or 5 eggs are laid.

HABITS—It has a peculiar flight which is quick, fluttering and fitful, resembling that of the fantail without the "evolutions" made by the latter. It flits its wings and tail when not in flight. It also has a peculiar habit of resting on the side of an upright tree, branch, or tree trunk, thence making a quick diving flight to the ground in search of food.

THE YELLOW HAMMER

SONG—

Key D: .s|s.s:s.s|s.s:s.s|t:—|—: ||
A little of bread and some nice cheese.

DESCRIPTION—Also known as the "Yellow Bunting." **Head,** yellow. **Upper parts,** reddish brown with dark spots. **Under parts,** yellow, with some dark marks. **Tail** contains some white feathers. **Legs,** light brown.

FOOD—Seeds and the shoots (plumules) of germinating seeds, especially of cereals. Hence considered one of the worst bird pests to the gardener and the wheat farmer.

NEST—Built on the ground, in dense hedge, or in thick shrub—seldom more than a few feet from the ground. October, November and December. (See pp. 43, 46.)

HABITS—Prefers the open country and the hedgerows rather than the haunts of men. Usually seen in small flocks. Its flight is undulating and fairly rapid.

THE WHITE-EYE

SONGS—

Key F: | $\overline{\text{f.m}}$: : $\overline{\text{f.m}}$
te u te u Repeated at intervals.

Key F: | f.f : f.m | f.m : | f.f : f.m | f.m : ||
te te te u te u

DESCRIPTION—Also called "Silver-eye," "Wax-eye," "Blight-bird." Each eye is surrounded by tiny, pure white feathers, so compact that they look like wax. **Back,** green and dark grey. **Sides,** pale brown. **Under parts,** light chestnut brown. A very pretty small bird. (Illustration, p. 51.)

FOOD—Small insects and fungi (blights); also nectar of shrub flowers and small berries.

NEST—Built in low brushwood or in lower branches of a shrub; usually around a forked twig. October to March (two broods). Nest not so deep as that of other small birds. (See pp. 43, 46). 3 or 4 eggs.

HABITS—Always in small flocks. Moves quickly among the outer branches of hedge-shrubs and trees in short hops and twittering flight. Often hangs upside down when searching for minute insects and blights.

THE HOUSE SPARROW

SONG—Somewhat harsh calls of Chill-il-il: Chill-il-il: Chirr-up: Chill-il-il—all on one note, and often repeated a dozen or more times.

DESCRIPTION—**Head,** bluish grey and brown. **Upper parts,** shades of brown, including a glossy dark chestnut. **Under parts,** bluish grey and white. **Legs,** yellowish brown.

FOOD—Seeds of wild flowers and cereals; also house-scraps.

NEST—Built in any sheltered place, usually in walls, eaves or spouting. (See pp. 43, 46.)

HABITS—Seldom seen far away from the haunts of men. Friendly bird—not troubled much with shyness. Shuffles its wings frequently, whilst hopping about. The sparrow and the starling are the two birds which show decided preference for resting and nesting on parts of dwellings and out-buildings.

THE GREY WARBLER

SONGS—Three or four different ones—all of most pleasing quality. One of the best of New Zealand songsters. Its notes are pure and sweet.

Key G: (1) |l,.s.f,.s:l.,t:l || Repeated 4 or 5 times without pause.

Key G: (2) .f|l:se|s:fe|f:fe|f (tr over each of the five bars) Each note trilled or warbled.

DESCRIPTION—Also called "Riro-riro" (Maori). **Upper parts,** brownish grey. **Under parts,** white, brown and pale yellow. **Bill,** long and sharp. **Tail,** white feathers underneath and also white tips to

upper feathers, occasionally spread out like that of the fantail, for which it is sometimes mistaken. **Eyes,** red.

FOOD—Insects and nectar of shrub flowers.

NEST—Different from any others; pear-shaped, very well made, opening on the side which faces the opposite direction to the prevailing winds; built in hedge or bush, frequently in tea-tree or manuka. (See pp. 43, 46). 5 or 6 eggs are laid in it.

HABITS—Flight, quick and fluttering; found near the towns (in gardens and hedges), and also in manuka scrub and thick "bush" country; is the foster parent of Shining Cuckoo. (See p. 66.)

THE GROUND LARK

SONG—A cry of pip-it: : : pip-it: : : : pip-it, whilst perched on a fence or tussock, and wagging its tail.

DESCRIPTION—Also called "New Zealand Pip-it" and "New Zealand Lark." Maori name, "Pi-hoi-hoi." **Upper parts,** brownish grey with a yellow tinge. **Under parts,** brownish white with a spotted breast. **Tail,** dark brown with white edges. **Legs,** yellowish brown. (Illustration, p. 51.)

FOOD—Insects, especially those found in dry, sandy soil.

NEST—Builds in October, also December-March (two broods). Nest is found in slight hollows in the ground or in tussocks. (See pp. 43, 46). 3, 4 or 5 eggs are laid in it.

HABITS—Prefers open country or land adjoining sea beach rather than near the haunts of men.

Often solitary or with mate only. Usually runs when on the ground, but hops occasionally. Flight is rapid and undulating; when flying upwards, it does so in a series of jerks.

THE TUI

SONG—Five bell-like notes, concluding with a **quick downward slur.**

Key B flat: | s : | d' : t : | f : | $\overline{\text{s . r}}$:

The notes are frequently changed, but the **quality** and the characteristic downward **slur** on last two notes are always the same, except when the tui imitates the song of some other bird.

DESCRIPTION—Also called the "Parson Bird" (white collar). **Bill,** black, long and curved. **Plumage,** glossy, greenish black, with a tuft and band of white feathers on its neck, and white stripe on each wing. **Legs,** dark brown, almost black.

FOOD—Nectar of flowers, especially those of New Zealand flax (phormium tenax), the wild fuchsia and of the kowhai tree; also the berries of several native trees. It has a protractile tongue, furnished at the tip with a bunch of fibres, specially adapted for the collection of nectar from large flowers.

NEST—Built usually in September. Seldom lower than 20 feet from the ground. Not as firmly placed as those of other birds, and so frequently dislodged by strong winds. 3 or 4 eggs laid in it. (See pp. 43, 46.)

HABITS—Flight rapid and graceful, accompanied by peculiar rustling movement of the wings. Not

a shy bird, often frequenting kowhai trees near homesteads, but greater numbers are found in the "bush" country.

THE BELL-BIRD

SONG—Very similar notes and bell-tone quality to those of the Tui, being richer and more varied, but without the finishing downward slur.

DESCRIPTION—**Plumage,** Olive green and brown. **Head feathers,** glossy with a purple tinge. **Wings and tail,** black. **Legs,** leaden grey. (Illustration, p. 51.)

FOOD—Same as that of the tui; also same kind of tongue. (See above).

NEST—Built October-January (sometimes two broods). Better made and more securely fixed than that of the Tui, but like the latter it is nearly always very high above the ground. Number of eggs: 4 or 5. (See pp. 43, 46.)

HABITS—Both male and female birds share in the hatching and subsequent feeding of their young. Frequently imitates the songs of other birds.

THE SHINING CUCKOO

SONG—Consists of notes which are liquid and rather sweet in quality. The final note has the peculiar effect of giving a false impression of nearness.

d'.d'.d'.d' : d'.d'.d' | 1 : 1 |— :—|—
cu cu cu----------phu ph----------u

DESCRIPTION—Maori name, Pipiwharauroa. **Head,** beak and wings, bronze green. **Neck** and

breast, covered with alternate bars of white and light brown. **Tail** has a number of white spots. **Legs,** dark brown, almost black. (See p. 51.)

FOOD—Caterpillars and grubs; also insects, spiders, earth-worms and small crabs; particularly fond of the grub of the Day-flying Moth. (See p. 20 of Part I.)

NEST—Uses that of another bird, usually the Grey Warbler or the White-head. One egg only, which is usually hatched in September or October, but sometimes later. (See p. 43.)

HABITS—Shy; more frequently heard than seen. Stretches out and quivers its wings when "singing." Arrives in New Zealand in middle of September, leaving again in February. (See p. 42). Although the young "warblers" are pushed out of the nest by the larger and stronger fledgling cuckoo, the parent "warblers" continue to feed it until some days after it has left the nest.

"The Maori could catch the spirit of the Shining Cuckoo's woodland voice:

Kui, kui,
Whitiwhiti ora,
Tio—o!

As James Cowan says—lines of pure music. A moment later we heard a really perfect call of this beautiful bird, similar to the Maori song, but with a number of 'kui's' in front." (E.G.T.)

"The preliminary notes have an upward inflection, and there is a long-drawn downward inflection at the finish." F.C.B.

THE LONG-TAILED CUCKOO

SONG—Cannot be represented, even approximately, by notes of music; a loud and shrill whistle with an upward slur—usually heard at night-time.

DESCRIPTION—Maori name is Koheperoa. **Head,** glossy dark brown with purple tinge. **Upper parts,** dark brown with reddish brown bars and spots. **Under parts,** white, with length-wise brown streaks. **Legs,** greenish yellow. **Tail,** brown, with white bars across the feathers. (Illustration, p. 51.)

FOOD—Chiefly insects of all kinds; also grubs and caterpillars. Occasionally young birds, especially finches, and lizards.

NEST—Egg is laid in the nest of the Yellow-Heads or in that of the Brown Creeper in the South Island of New Zealand. The White-head's nest is favoured in the North Island. Egg laid in November or December. (See p. 45.)

HABITS—Remains in high branches of trees until sunset. Most active just before night-fall. Much more numerous in the South Island than in the North.

This is a much larger bird than the Shining Cuckoo (see p. 48). Its beautiful plumage of streaked and speckled brown and white feathers is best seen when the cuckoo is in flight. Those who live in or near Auckland should not miss seeing the splendid specimens of this and other birds contained in the Auckland War Memorial Museum.

"My experience is that, in the Urewera country, this bird is not usually heard at night, but throughout the day in the hottest and brightest sunshine—

the kind of day when the cicada is heard at its loudest. Its call is then a loud and somewhat harsh note rather than a shrill whistle." F.C.B.

"Kupe, a high-born native of Tahiti, reputed to be the first human being who ever set foot in New Zealand since the dawn of history, noticed the arrival of Long-Tailed Cuckoos from the south, when he was on a visit to Rarotonga. Soon afterwards a tribal war caused him to leave this island, and he decided that he would attempt to discover this unknown southern land from which these birds had migrated. After a hazardous journey in a small canoe, he arrived at the North Cape of New Zealand about 1,000 years ago. It was Kupe who gave this country the distinctive name 'Aotea-roa'—the Land of the Long White Cloud."

(Arthur Mee)

THE KIWI

SONG—A loud whistling cry with an ascending slur—seldom heard in the day-time.

DESCRIPTION—**Upper parts,** dark brown, slightly glossy. **Under parts,** greyish brown. **Bill,** white, long and curved. **Legs,** dark brown, thick and strong. No wings and no tail.

FOOD—Grubs and worms.

NEST—In or under a fallen hollow tree, or under the roots of a large tree. Usually only one egg, but occasionally two—very large, three times as large as a duck's egg—one of Nature's wonders. (See pp. 43, 46.)

HABITS—Several unusual ones. The **male** bird hatches the egg, the female bringing him food dur-

ing the hatching period. It defends itself by kicking with one of its strong legs, at the same time opening wide its long bill, whilst balancing its body on the other leg, with its back against some firm support. (See illustration on cover.) When disturbed, it assumes a perfectly motionless position, and will remain thus for a long time, if not molested. It has a strong sense of smell, and can be heard "sniffing" when in search of food. It taps the ground with the tip of its beak, until it strikes a worm-hole in the ground, which it then widens by a twisting movement of its "bill," thus enabling it to reach the worm and drag it out more easily. It hides all day under large logs or in holes in trees, coming out to feed at dusk. As soon as the young Kiwi is a few days old, it begins "to fend for itself," and the parent birds show no further interest in it. The Pukeko and the Kiwi make an appropriate combination for a lesson on bird contrasts—each is the opposite of the other in almost every detail of construction and habits.

THE BUSH HAWK

SONG—A shrill scream whilst in flight—not frequent.

DESCRIPTION—Also called the "Sparrow-Hawk." **Head and upper parts,** greyish black. **Under parts,** pale reddish brown. **Breast,** light brown, but each feather is edged with a triangular black mark. **Feet,** yellow with black claws. **Eyes,** yellow. (See p. 59.)

FOOD—Small birds, young rabbits, rats and mice; also dead rabbits (killed by motor-cars or gun).

NEST—Always built in a tree; sometimes is merely an old nest—Hawk's or Wood-Pigeon's—with a few twigs added. New nests consist of small, dried sticks intertwined. Eggs, 4, 5 or 6. (See p. 43.)

"The Maori name is ka-re-a-re-a in imitation of its harsh scream. The height to which Bush Hawks rise in the air makes them susceptible to the slightest change in the condition of the atmosphere, and they are thus warned of approaching changes in the weather. Hence, the Maoris say, "If the ka-re-a-re-a screams in fine weather, it will soon rain; if in rainy weather, it is about to clear."

(Sir W. Buller)

HEDGE SPARROW

SONGS—Four or five, not quite so pure in quality as those of the Grey Warbler, but quite pleasing.

Key F: (1) | m, m, m : f, m, m : f, m, m | m : ||
le ri ri le ri ri le ri ri re
(short vowel in ri)

Key F: (2) | m, m . r, d : m, m . r, d : m, m . r, d | m :
le ri ri ri ---------- re

Key C: (3) | 1 . 1 : r', l, f | 1 . 1 : r', l, f | 3 or 4 times,
then | s . f ||

GENERAL—The name is most inappropriate, as it belongs to a different family from that of the sparrow, and has very little resemblance to it in any way. It is one of the "warbler" family, which also includes the Grey Warbler and the Tom-tit.

DESCRIPTION—**Head,** bluish grey with brown streaks. **Upper parts,** reddish brown, streaked dark brown. **Breast,** bluish grey (distinguishing feature). **Under parts,** buffish white. **Legs,** yellowish brown.

FOOD—Insects of all kinds; also caterpillars and grubs.

NEST—Similar to that of the Tom-tit; usually somewhat difficult of access in hawthorn hedge, but sometimes in gorse or other low bushes. September to January. 4, 5 or 6 eggs. (See pp. 43, 46.)

HABITS—Shy bird, hiding in hedge or bush except when feeding. Seldom takes a long flight, usually flying short distance only from its "cover." Hops and shuffles its wings—the latter being one of its distinctive habits. Occasionally sings at night-time in the bush or shrub country, even when the night is moonless. It has not been seen further north than the Waikato.

THE WOOD PIGEON

GENERAL—The New Zealand Pigeon is a much larger bird than the imported tame pigeon, and has much grander plumage. Its flight is more laboured and noisier.

DESCRIPTION—**Head,** bright green with yellowish tinge. **Upper parts,** dark purple and greyish green. **Under parts,** white from breast to tail. **Legs,** bright red.

FOOD—Chiefly berries of native trees, especially those of karaka, titoki, puriri, miro, fuchsia and pigeonwood. Also nectar from tree flowers—also soft leaves in winter.

NEST—January or February. Amongst dense foliage of a tree or in scrub on the side of a cliff. (See pp. 43, 46.)

HABITS—Keeps to the thick "bush" country. When resting, is usually seen on branch of a high tree with tail half-spread and head drawn in (cf. hen at "roost"). When disturbed, it shoots out its neck and sways its body, at the same time coo-ing. It is a shy bird and shuns the haunts of men.

NOTES—Its chief usefulness is its help in the spread of the growth of native trees by carrying the seeds of the berries and by the pollination of tree flowers.

THE CALIFORNIAN QUAIL

SONG—The female seldom makes any kind of vocal sound, but the male has two distinct calls, one of which it continues to make all day long in the nesting season. It resembles the syllables, **"Pa-rah-ho,"** uttered in a pleasant-sounding "call." When disturbed, it makes a warning "call," rapidly repeated several times, and resembling the sounds "pit-pit" or "whit-whit."

DESCRIPTION—**Upper parts,** mottled brownish grey. **Under parts,** medium grey. **Legs,** dull grey. **Head,** grey, with a line of white feathers extending from the eye under the "bill." It also has a distinctive black top-knot or crest, directed to a forward point.

FOOD—Seeds, tender shoots and roots—a serious pest in some districts to farmer and gardener—also larvæ and insects.

NEST—Made in a depression on the ground or in a tussock, in the month of November. (See pp. 43, 46.)

HABITS—Has a very swift flight, making a loud whirring noise when rising from the ground; glides, with outspread wings, before alighting; haunts waste lands most, but also found in cultivated districts; does not hop, but runs very fast; walks, when undisturbed.

NOTES—Nelson was the first district into which this bird was introduced, nearly seventy years ago. It increased in numbers so rapidly that a quail-canning industry prospered for some years, and as many as 20,000 frozen quail were sent from Nelson to London in one shipment. One of its original homes is the famous Yosemite Valley which includes the Californian National Park. Its worst enemies are stoats, weasels, ferrets, rats and wild-cats, which undoubtedly dispose of large numbers of them; and yet it is evident that quail have increased in some districts where stoats and weasels are also numerous. The theory has been advanced that quail are subject to a mysterious natural law, causing alternating periods of increase and decrease in numbers.

THE REDPOLL

SONG—Variable, but its notes are loud and clear.

PLUMAGE—**Forehead,** red and edged by a brown band; **breast,** carmine pink, streaked with brown; **upper parts,** brown. (See p. 59.)

FOOD—Grass seeds, including those of toe-toe grass; also weed seeds, buds of young trees, and aphides, especially the rose aphis.

NOTES—Its flight is nimble and buoyant. Redpolls are often seen in large numbers near sandhills, especially in winter.

THE MAGPIE

SONG—Clear flute-like notes, an hour or more before sunrise.

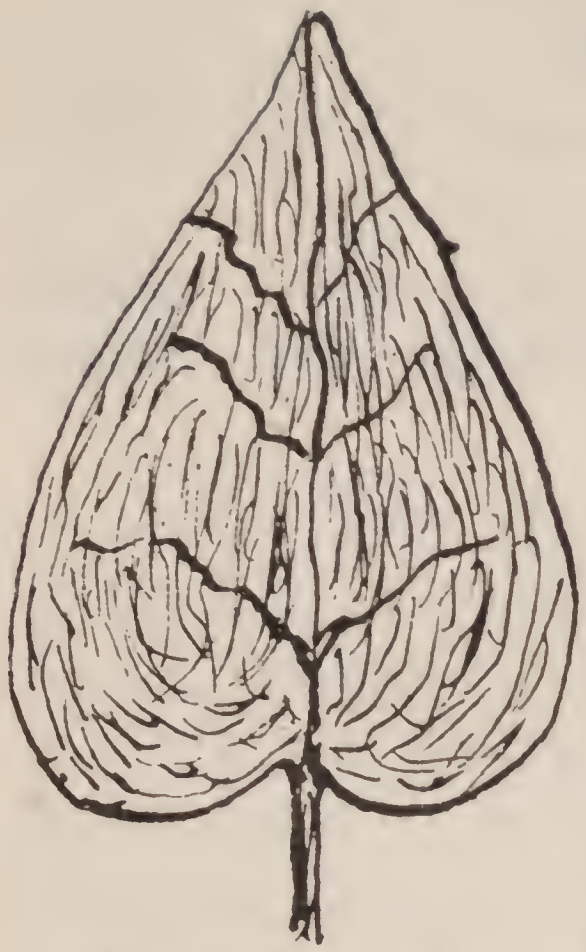
PLUMAGE—**Head,** glossy blue-black; **upper parts,** black and white; **breast and under the wings,** white.

FOOD—Insects only, when in the wild state.

NOTES—Imported from Australia. Magpies mate for life—unusual among birds. They are great fighters and will defend a nest against marauders, even human beings, with great ferocity. Have been known to attack a picnic party settled near the tree containing their nest.

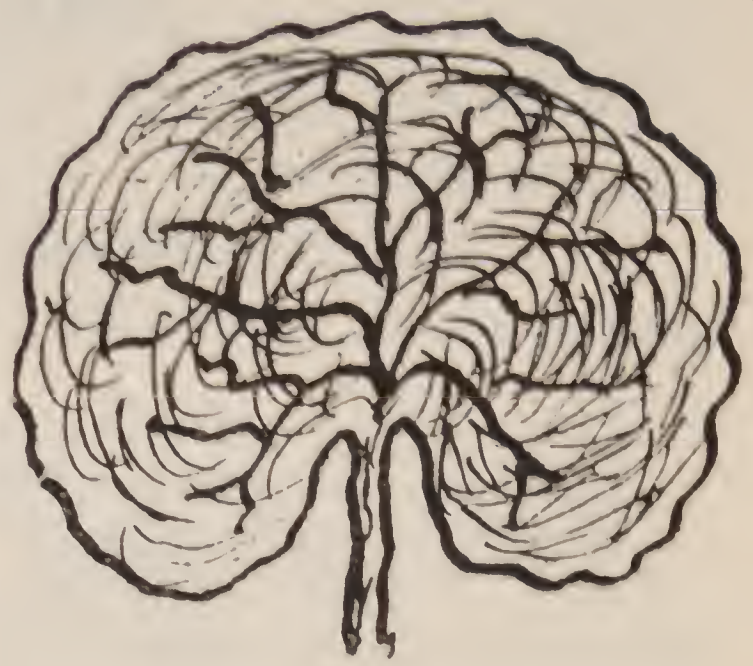
THE GODWIT

"Godwits, and also several other wading birds, such as turnstones, the golden plover and knots, come to New Zealand for the summer. Unlike the cuckoos, which lay their eggs while in New Zealand, they make their nests and raise their young in Siberia, Alaska and other countries of the far north. The best-known of these visitors is the bar-tailed godwit, often miscalled "snipe" or "curlew." It usually assumes its summer plumage of spotted and streaked chestnut and black feathers before it leaves New Zealand in the autumn. Its food consists chiefly of worms, molluscs, vegetable matter and small crabs which it obtains during low tide on the mud and sand flats near the sea. It is called "kuaka" by the Maoris, and in the early days they caught large numbers for food by means of flax-made nets and snares, suspended from stakes driven into the sand. These were set at low tide, and the birds were caught after nightfall with the additional aid of lighted torches." (See p. 51.) E.G.T.



Heart-Shaped

Ovate (acute)

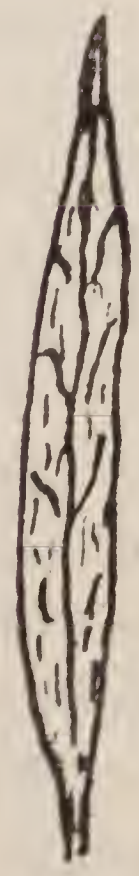


Kidney-Shaped

Arrow-Head

Ovate (obtuse)

Sword-Shaped



Lance-Shaped

SHAPES OF LEAVES (as named in this book)

PART III.—FLOWERS

Introductory Notes

It will be easy to identify any of the wild flowers described in this book from the notes given, if suitable collections have been previously made by the scholars: e.g., If **Tarweed** flowers required, a collection of all the yellow flowers, not dandelions or buttercups, and not more than a foot high, would probably contain these, which will be recognised from descriptions herein of flowers and leaves. If **Centaury** flowers, a collection of all pink or red flowers, other than clovers, from pasture paddocks and meadows would be almost certain to include some. As full-grown leaves of the flower plants will help to ensure correct identification, it is advisable to request scholars to bring the whole of each plant, except the roots, when they make collections for lesson purposes.

Nearly all the wild flowers described in the following pages are accounted as weeds by the farmer and gardener; but there are very many common weeds not mentioned in this book, because they are not sufficiently "attractive" to be considered as "flowers" by young scholars.

THE DAISIES

GENERAL—Several species, of which the five given below are seen most frequently in New Zealand, all have flower heads consisting of a **yellow** central "disc" with an outer "ray" of **white** petals.

(1) FIELD DAISY, also called the "Common Daisy." Found in pasture paddocks, especially if badly drained. Flower stems, 1 to 3 inches. Popular with very young children for making "daisy chains." Its leaves are prone on the ground, forming a small dense mat.

(2) OX-EYE DAISY, also called the "Dog Daisy." Found in waste lands, by the wayside, and in damp pastures. The largest of the daisies—1 to 3 feet high. It is the only large daisy which has **leafy** foliage—**leaves,** dark green with lobular edges. **Flowers,** "solitary" on long stalks; when full-grown, they are $1\frac{1}{2}$ to 3 inches in diameter.

(3) CAMOMILE DAISY, also called "Sweet-scented Camomile." Very common, being frequently found in stunted growth at the edge of hard footpaths: also grows in waste land and by the wayside. **Leaves,** "indefinite," somewhat resembling soft pine needles: pleasant smell when crushed. **Flowers,** small, $\frac{1}{2}$ to $\frac{3}{4}$ inch diameter. (See p. 89.)

(4) SCENTED CAMOMILE—Resembles No. 3 in appearance of leaves only, otherwise very similar to No. 2, and so frequently mis-called the "Dog-Daisy."

(5) MALODOROUS CAMOMILE—**Leaves** resemble those of No. 3, but unpleasant smell. **Flowers,** medium size, 1 to $1\frac{1}{2}$ inches in diameter.

SUMMARY—Given in order of size of flowers: Ox-eye Daisy, Scentless Camomile, Malodorous Camomile, Sweet-scented Camomile, Field Daisy. All are found growing by the roadside, in waste corners, and on the banks of streams and ditches.

THE BUTTERCUPS

(1) BULBOUS BUTTERCUP—**Flowers,** largest of all, five glossy, yellow petals and numerous stamens. **Leaves** (also **stems**), hairy and erect. **Roots,** fibrous, but topped by a bulbous growth just below the surface of the ground. Grows in waste lands, pasture paddocks and meadow-land, especially near the hedges.

(2) HAIRY BUTTERCUP—**Flowers,** large—nearly as large as No. 1, and otherwise the same. **Leaves** and **stems,** more hairy than No. 1. **Roots,** no bulbous top.

(3) CREEPING BUTTERCUP—**Flowers,** smaller than Nos. 1 and 2. **Stems,** creeping stems, close to the ground and rooted at the "nodes." Leaf and flower stems grow upwards from each of the "runners" at almost every "node."

(4) CELERY-LEAVED BUTTERCUP—Thrives in damp ground and in ditches. **Flowers,** small; not more than $\frac{1}{4}$ inch diameter; petals all yellow. **Leaves,** glossy bright green, each having a separate stalk and three "lobes." The only buttercup with **hairless** leaves and stems.

(5) FLOATING BUTTERCUP, also called "Water Buttercup." Grows on the surface of shallow streams or open drains. **Flowers,** yellow and white petals—chiefly white.

(6) DWARF BUTTERCUP, also called "Fairy Buttercup." Usually found in dry waste ground and sandy parts of pasture paddocks. **Flowers,** yellow, but very small—less than $\frac{1}{4}$ inch in diameter.

THE DANDELIONS

GENERAL—More than half-a-dozen species of plants with yellow flower-heads are frequently miscalled "Dandelions." Nos. 2, 3, 4 and 5 are the ones found most abundantly. (See p. 81.)

(1) TRUE DANDELION—**Leaves,** smooth, large and with irregular "toothed" edges, hence name, derived from Fr. "dent de lion" = lion's tooth. The parts of the leaf to right and left of midrib are always unequal. **Sepals,** curling backwards from the petals towards the stem—a distinctive feature. **Stem,** smooth, seldom green, usually a reddish tinge, and so hollow that by removing the heads, it is easy to make a dandelion chain from a number of stems, each stem forming a link. **Flowers,** bright yellow and large; 1 to 2 inches diameter. Separate stem for each flower.

(2) HAWKBIT—**Leaves,** small, hairy, and with few, if any indentations. **Stem,** no branches, hairy, green colour, hollow, but very thin. **Flowers,** small, $\frac{1}{4}$ to $\frac{1}{2}$ inch diameter.

(3) CATSEAR—**Leaves,** very hairy on both sides; lie prone on the ground, forming a mat; distinctly lobed; if part of leaf including two adjoining lobes, is held between the two thumbs, the resemblance to cats' ears is striking, hence name. **Stem,** has branches; hairless, dark green, no leaves on stem, but sometimes small imperfect leaves at junction of branches. **Flowers,** similar to No. 2—slightly larger.

(4) HAWKBEARD—**Leaves,** same shape as, but smaller than true dandelion; hairless. **Stem**

3. Hawkbit

2. Catsear

1. Hawkbeard

has branches, with small leaves on the stems of the branches. **Flowers,** about same size as Catsear flowers.

(5) SOWTHISTLE, also called "Milky Thistle" and "Rauriki" (Maori). Larger plant than the others in this group—usually found in ground that has been previously cultivated. **Leaves,** lobed, slightly prickly, succulent, dark green, sometimes having a purplish tinge: popular food for tame rabbits. Shape and size are approximately same as dandelion leaves. **Flowers,** yellow. **Notes:** The Maoris cook the leaves and use them as a vegetable. Finches and canaries are fond of the seeds.

NOTE—Easiest plan of identification is to examine (1) stem, (2) leaf, (3) flower.

POISONOUS PLANTS

The following are more or less poisonous, and young scholars should be warned against putting parts of them in their mouths:—

(1) **Hemlock:** All parts.

(2) **Buttercups:** Leaves, flowers and seeds, especially unripe seeds.

(3) **Privet** (hedge shrub): The small black berries.

(4) **Sorrel:** The leaves contain salts of lemon, which are harmful to children.

(5) **Nightshade** (see p. 95): All parts, but especially the purplish black berries.

(6) **Ivy:** The dark black berries, which grow in winter, are eaten by birds, but are harmful to children.

(7) **Flannel Leaf** (see p. 87): The seed only.

(8) **Foxglove** (see p. 87): All parts, the seeds being most poisonous.
(9) **Wistaria:** The mauve-coloured flowers.
(10) **Violets:** The underground stems and the seeds.
(11) **Boxwood:** All parts of this ornamental shrub.
(12) **Larkspur and Delphinium:** All parts.
(13) **Lily of the Valley:** All parts, especially the flowers.
(14) **Columbine** (Monkshood): All parts, especially the seeds.
(15) **Laburnum:** Every part, including the bark and the pods.
(16) **Red Poppy:** All parts when juicy—poisonous property lost when the part of the plant is dried.

THE PRUNELLA

GENERAL—Also called "Self-Heal" and "Heal-All." One of the most common wild flowers in New Zealand, and can almost invariably be found within a stone's throw of any school. It is a perennial. **Height,** usually 4 to 8 inches. (See p. 85.)

LEAVES—Ovate (acute), converging towards leaf stem; arranged in equal opposite pairs, the highest pair being at the base of the flower-head.

FLOWERS—Several small **purple** "bunny"-shaped odourless flowers growing out from a cylindrical head, about $1\frac{1}{2}$ inches long and one inch wide. When all the tiny flowers on the head have died, the latter becomes a dark brown colour. Only one flower-head on each stem.

NOTES—Easily recognised by relatively large flower-head of small, purple flowers with two opposite leaves, adjacent, on same stem. Children will remember name easily from the words "prune" and "Ella" (girl's name).

PENNYROYAL

GENERAL—Perennial. Usually found in patches, sometimes covering several square feet of ground.

LEAVES—Similar to those of the Prunella, but smaller; sometimes three or four joining the main stem at the same point.

FLOWERS—Clusters of tiny mauve flowers grow at three or more different places on each of the plant stems. Strong, minty smell. These are the characteristics which distinguish it from the Prunella, which is frequently miscalled Pennyroyal. **Stems,** some trailing and some upright.

NOTES—It is a bad weed for the pastures for two reasons: its "mat" habit of growth produces much waste land: its juice is harmful to stock, especially cows.

FAIRY FLAX

GENERAL—Also called "Wild Linseed" and "Wild Flax." One of the commonest of wild flowers in New Zealand. Found growing in waste places, by the road-side and in meadow-land.

LEAVES—Insignificant, narrow, lance-shaped, $\frac{1}{4}$ to 1 inch long.

FLOWERS—5 pale blue petals on a long, thin, tough stem. These soon fall, after flower is picked,

Prunella

Scarlet Pimpernel

Tarweed

Vervain

chiefly on account of small calyx. Usually only one flower on each stem. **Size,** $\frac{1}{2}$ inch diameter. **Seeds,** small linseed. **Height,** 1 to 2 feet.

NOTES—Resembles the flax plant grown in the British Isles and in Canterbury Province, New Zealand, but of smaller size. In the British Isles, linen is made from the fibres of the tough flower stems, chiefly at Belfast in Ireland. In Canterbury, the farmers grow it for its seed, from which linseed oil, linseed cake (cattle food), etc., are made.

THE SCARLET PIMPERNEL AND THE CREEPING MALLOW

GENERAL—The latter is often mistaken for the former, as the flowers of both plants are small and of scarlet-red colour, with 5 petals. Both are fairly common in all parts of the North Island, but the Creeping Mallow is uncommon in the South Island. They are found growing in waste places, by the roadside, and as weeds in cultivated gardens. (Illustration, p. 85.)

DIFFERENCES—The **stems** of Scarlet Pimpernel are square, and seldom longer than 9 inches; those of Creeping Mallow are frequently more than 2 feet, creeping along the surface of the ground, and rooting at short intervals. The **leaves** of Scarlet Pimpernel are relatively larger than those of Creeping Mallow. The latter have stalks, but the former are stalkless. The **flowers** of Creeping Mallow are slightly larger than those of Scarlet Pimpernel—about $\frac{3}{4}$ inch diameter.

FOXGLOVE

GENERAL—It is also called "Fairy's Glove," and is one of the largest wild flowers in New Zealand. It thrives best on ground on which little grass, if any, is growing.

LEAVES—These grow out in a circle from the main stem, and are 6 to 12 inches long. **Colour,** dark green. **Hairs,** few or none. **Shape,** ovate (obtuse).

FLOWERS—**Shape,** bell-shaped. **Colour,** various shades of yellow, purple and white. **Number,** a large number of them grow around the highest part of the tall stems, which range from 2 to 6 feet in length.

NOTES—The inside of the "bell" is usually "speckled." All parts of the plant are "poisonous." It grows to its greatest height on bush-burn country, dry river beds, and ground formed by a recent landslip.

FLANNEL LEAF

GENERAL—Also called "Mullein," "Golden Rod" and "Tobacco Plant." Like the Foxglove, it is seldom seen on good land, but thrives on old river-beds, etc. It also grows well on shingly ground near the sea.

LEAVES—Large, and with prominent midrib. The plant receives its name from the soft, woolly feel of the leaves which are unusually thick, with short hairs on both surfaces. **Shape,** ovate (acute).

FLOWERS—**Shape,** saucer-shaped. **Colour,** 5 yellow petals and 5 large stamens. **Stalk,** none.

Number, several, covering the top 6 to 12 inches of the long stem, which is sometimes more than 3 feet high. (See p. 89.)

NOTES—No reason known for name, "Tobacco Plant," as it does not resemble that plant, and has never been used as a substitute for tobacco.

THE EVENING PRIMROSE

GENERAL—Thrives best in the same kind of ground as the Foxglove and Flannel Leaf. (See pp. 87, 93.)

LEAVES—**Colour,** dark green. **Shape,** ovate (obtuse). **Hairs,** none. **Stalk,** none. **Appearance,** distinct midrib. **Size,** 3 to 6 inches long.

FLOWERS—**Shape,** basin-shaped. **Colour,** 5 overlapping, yellow petals. **Sepals,** large. **Stalk,** medium; 1 to 2 inches. **Size** of flower, about 3 inches diameter.

NOTES—The flowers close their petals during the afternoon, opening at sunset, and remaining open until noon on following day. They have a pleasant odour, which is sometimes scarcely perceptible. The flowers wither very soon after reaching maturity.

PERIWINKLE

GENERAL—Also called "Wandering Willie." It is usually found growing in large patches on river banks, on old walls, or by the roadside.

LEAVES—Heart-shaped, and joining the stem in opposite pairs. **Colour,** medium green and slightly glossy. **Stem,** cylindrical, and glossy green.

1. Camomile
2. Bladder Campion
3. Storksbill
4. Flannel Leaf

Trailing for great lengths and often twining around obstructions.

FLOWER—5 pale purple **petals,** separate except for vase-shaped nectary—usually one flower on each stem. **Sepals,** hair-like and tender. **Odour,** faint, pleasant.

STEM—Fairly long—1 to 1½ inches, joining the plant stem at the same point as a leaf.

NOTE—Sometimes used in large gardens to cover an unsightly bank or outbuilding.

CENTAURY

GENERAL—Also called "Red Centaury." Very common in pasture paddocks as isolated plants or in small clusters. Does not thrive in poor soil. **Height,** 1 foot to 18 inches.

LEAVES—Relatively small and insignificant. **Position,** in opposite pairs, a pair of leaves growing at the point where a flower-stalk joins the main stem. Stalkless and hairless.

FLOWERS—Growing in small clusters, each cluster growing at the top of a short stalk, two or three of which join a much longer branch stalk. **Petals,** 5, bright reddish-pink. **Size** of flower, about ½ inch diameter.

STEMS—Very erect, square-shaped and hairless.

NOTES—Flowers, although small, are attractive, and, on account of relatively small leaf growth, are easily seen.

TARWEED

GENERAL—Thrives in damp pastures and badly drained meadow-land—also in damp, waste ground. **Height,** 6 to 12 inches. (Illustration, p. 85.)

LEAVES—**Colour,** dark green, sometimes tinged with black. **Hairy,** and when full-grown, somewhat sticky, thus catching small insects which alight on them, hence name of plant. **Shape,** feather-shaped. **Stalks,** no separate stalks, but growing out from the main stem in pairs that are sometimes nearly opposite. **Midrib** and under-surface veins are prominent; two parts of leaf, divided by midrib, are almost identical, each having 8 or 9 small pointed lobes when full-grown.

FLOWERS—**Colour,** yellow and solitary. **Shape,** "bunny" flowers, i.e., similar to those of the "snap-dragon" (antirrhinum). **Calyx,** very noticeable, consisting of half-divided sepals, pointed at the top, and fitting closely round the nectar-vessel of the flower. **Stalk,** none. **Odour,** none.

CHICORY

GENERAL—Not very widespread, but grows abundantly in some districts, e.g., near Ohaupo. Grows by the wayside and in other waste places. **Height,** 2 to 4 feet.

LEAVES—**Shape,** like those of true dandelion, with somewhat wider space between the "teeth." **Position,** occur singly along the plant stem and also in a group near the ground. **Hairs,** none.

FLOWERS—**Petals,** attractive bright blue, with serrated tips, and surrounding a central disc. **Size,**

1 to 1½ inches diameter. **Position,** some distance down from the top of the plant stem. Large flower buds higher on the stem and smaller buds near the top.

STEM—The plant stem has seldom any branches, and is grooved.

NOTES—It is the root, ground fine, which is mixed with coffee.

MALLOW

GENERAL—One of the large wild flowers which is common in nearly all districts in New Zealand, growing by the roadside and in places where the soil is fairly good.

LEAVES—**Shape,** kidney-shaped, with 7 lobes, having crinkled edges. **Size,** large, 1½ to 3½ inches diameter. **Stalks,** long.

FLOWERS—**Shape,** basin or wide-bell shape. **Size,** ¾ to to 1½ inches in diameter. **Colour,** light and medium purple shades. **Stalks,** short. **Number,** comparatively large number of flowers open at same time, making this one of the most attractive of wild flowers.

BLADDER CAMPION

GENERAL—Although not very common, it grows in many districts in all parts of New Zealand, being most numerous in the Canterbury Province. It thrives both in waste places and in cultivated fields. **Height,** 1 to 2 feet.

LEAVES—**Position,** in opposite pairs on the main stem. **Stalk,** none, hence each pair of leaves

Red Ink Plant

Evening Primrose

join at their bases. **Shape,** heart-shaped, with elongated tip. (See p. 89.)

FLOWERS—**Petals,** 5 white petals, with divided edges. **Calyx,** bladder-shaped, giving the characteristic appearance from which the flower is named. **Stalks,** ½ to 1¼ inches, slender.

STEMS—Upright and branched, all branches being somewhat slender, but fairly tough. The flower stalks join the branch stems of the plant.

RED INK PLANT

GENERAL — Also called "Inkweed" and "Pheasant Weed." It is a perennial wild shrub with brittle greenish stems, 2 to 5 feet high. It thrives on waste lands, especially those which have previously been cultivated. Also found in pasture paddocks. (Illustration, p. 93.)

LEAVES—**Shape,** feather-shaped, with even edges. **Size,** 3 to 4 inches long. **Colour,** dark green. **Stalk,** short, sometimes none.

FLOWERS—Small, green, 5 petals, growing on upright stalks, 3 to 6 inches in length.

BERRIES—These succeed the flowers and are very attractive. **Colour,** dark purple. **Contents**, a deep red juice resembling red ink (hence name of plant)—also the seeds of the plant.

VERVAIN

GENERAL—Also called "Griffin Weed." Grows abundantly by the wayside, thriving best in dry soil. **Height,** 1 to 2 feet. (Illustration, p. 85.)

LEAVES—**Size,** relatively small. **Shape,** irregular, having 5 or more lobes when full-grown. **Colour,** dark green. **Number,** small in comparison with number of stems and flower-tips.

FLOWERS—**Arrangement,** in clusters around the tips of the numerous long stems. **Size,** the individual flowers are very small. **Colour,** 5 mauve- or lilac-coloured petals. **Stalks,** very short.

NOTE—The plant presents the appearance of a maze of slender stems, each tipped with an inch or more of tiny lilac flowers. By the wayside, the beauty of these is usually marred by a covering of dust.

NIGHTSHADE

GENERAL—Also called "Deadly Nightshade" and "Black Nightshade." Chiefly found as a weed in gardens, and in suitable ground becomes a shrub, 18 inches or more in height. It is common in all parts of New Zealand.

LEAVES—**Shape,** broad, heart-shaped, with bats-wing edges and prominent veins on under surface. Leaf has its widest part at the ends of the two veins furthest from the leaf tip, which is pointed. (See illustration on cover.) **Colour,** dark green. **Number,** relatively large for size of plant.

FLOWERS—Cluster of small white flowers, 5 petals, sometimes having a purplish tinge. **Size,** $\frac{1}{2}$ inch diameter.

BERRIES—The flowers are succeeded by dark green juicy berries, which become quite black when ripe, and are seen in clusters of from three to seven berries in each cluster.

SPEEDWELL

GENERAL—One of the commonest of the **small** wild flowers. Grows in waste places and in pasture paddocks, especially where there are dry patches: also a garden weed.

LEAVES—**Size,** relatively large. **Shape,** heart-shaped, with blunt, toothed edges. **Hairs,** numerous, especially on upper surface. **Number,** numerous, almost hiding the flowers.

FLOWERS—**Colour,** pale blue with only two stamens. **Shape,** saucer-shaped. **Size,** less than $\frac{1}{2}$ inch diameter.

STEMS—About six inches long; round and hairy. Sometimes upright, sometimes trailing.

NOTES—Sometimes called "Bird's-Eye." Petals soon fall after flower stems have been broken from the plant.

LADY'S THUMB

GENERAL—Also called "Persicaris," "Willow-Weed," "Knot-Weed" and "Red Shank." The last-named is also given to three or four other weeds. Common as a garden weed: also thrives in damp waste land and along the sides of ditches.
Height, 1 to 2 feet.

LEAVES—**Shape,** like those of the willow-tree, hence one of the names of the plant. **Colour,** medium green, with a small darker patch on the upper side of nearly every leaf, near the middle of it, as if it had been pressed between a small thumb and finger, hence one of the names. **Size,** $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long.

FLOWERS—A compact cluster of 50 or more minute **pink** flowers at the top of each stem. **Stalks,** none.

STEMS—Round, **red tinge,** smooth, and with prominent **knots** at the junctions of leaves and stem, hence two other names of the plant.

CONVOLVULUS

GENERAL—There are two varieties common in New Zealand, one of which has much larger leaves and flowers than the other. Both are found in most districts, growing in waste places and in gardens. When once established, it is most difficult to eradicate, and is consequently one of the worst of garden weeds. It is also called "Morning Glory" and "Bind-weed."

LEAVES—**Shape,** arrow-head shaped (similar to those of sorrel and arum lily). **Stalks,** relatively short. **Size,** one to three inches in length.

FLOWERS—**Colour,** white (the larger variety), pink or purple. **Shape,** bell-shaped. **Size,** $\frac{3}{4}$ to $1\frac{1}{4}$ inches diameter.

STEMS—Very long, twining stems with comparatively few branches.

NOTES—The perennial, underground, creeping stems enable this plant to take possession of large areas in a short time. It is consequently one of the most serious plant-pests in New Zealand, if allowed to reach useful soil.

YARROW

GENERAL—Thrives in waste places, especially on the road-side, but is also common in cultivated fields, constituting a troublesome weed on account of its creeping roots like those of "twitch." **Height,** 1 to 2 feet.

Yarrow (after Fream)

LEAVES— **Shape** and **appearance,** feathery. **Odour,** quite strong, when crushed— not unpleasant. **Colour,** dark green, when full grown. **Position,** forming a "rosette" near the ground when the plant is young, and at the junctions of branch stems with main stem, when full grown.

FLOWERS—Large, flat clusters of small, creamy white flowers at the top of each branch stem. These masses of flowers are usually so near to one another as to give the appearance of one large cluster, thus making the plant very conspicuous.

STORKSBILL

GENERAL—This flower is also called Cranesbill, both names being derived from the shape of the ovary. The botanical name is "Erodium," and it differs from the other common plants of this family, e.g., the Geranium and Herb Robert, by having

only 5 stamens. It grows in waste places and also in cultivated fields.

LEAVES—Compound, feather-shaped and cut into segments, resembling those of parsley: dark-green colour, numerous very short hairs on both surfaces.

FLOWERS—Grow in clusters, each flower having 5 petals of pink or purple colour. Size of flower, about $\frac{1}{3}$ inch diameter. Five pointed sepals which open wide when the ovary begins to elongate to form the "bill."

STEMS—Round, frequently of reddish tinge, and covered with very short hairs.

NOTE—It is usual for two or three leaf-stems and also a flower-stem to join the stem of the plant at the same point. (See p. 89.)

RAUPO

GENERAL—These plants, which are so common in New Zealand swamp lands, are large "reeds."

LEAVES—Long, sword-shaped, medium green blades, differing from those of the New Zealand flax by being flatter and less juicy.

FLOWERS—Large clusters of tiny indefinite florets, which change to dark, chestnut-brown woolly tufts of cylindrical shape. **Stems,** upright, strong and straight—2 to 4 feet long.

USES (by the Maoris)—**Leaves,** for thatching buildings. **Flower Sticks,** for making rough rafts to carry goods, etc. (Strands of New Zealand flax are used for binding the "sticks," and they are covered by flax leaves.) **Flowers,** for making

pillows and cushions. They are stuffed into baskets of plaited flax for this purpose. **Roots,** two uses: (a) they are cleaned, baked and eaten, or (b) they are dried, beaten and ground into a kind of flour from which "raupo" bread is made.

BUSH CLEMATIS

GENERAL—One of the best-known of the New Zealand bush flowers. Called by the Maoris, "Pua-wananga" (the sacred or sanctified flower).

LEAVES—Small and few in number; thick and glossy.

FLOWERS—Single white flower on each stalk. **Petals,** none. **Sepals,** seven; these look like petals and form a beautiful star-like flower. **Stamens,** several, forming a purplish-green centre.

STEMS—Numerous; they coil themselves spirally round the branches of other trees in order to drag the plant up to the sunshine. They seize and coil themselves around any twig against which they are blown by the wind. Consequently, it is a common sight to see their festoons of starry, white flowers looped from tree to tree on the edges of the dark bush country. (Laing and Blackwell's "Plants of New Zealand.")

SEEDS—Its feathery wreaths of seeds are almost as beautiful as the flowers. They are in clusters, and each seed has a long, silky, silvery plume, which enables the wind to carry it a long distance.

ASTELIA

GENERAL—One of the most common of New Zealand bush flowers. The name means "having no trunk or stem," and the plant is so called, because it grows in the forks or depressions of large forest trees.

LEAVES—Long, sword-shaped, bright green, tough. They become very thick towards the base, and curve inwards, overlapping one another, thus forming a saucer in which water is retained for use by the plant. It is quite usual to find drops of water here after a long drought.

FLOWERS—Beautiful, graceful sprays of tiny white or yellow flowers, sometimes tinged with purple. They sometimes form large, spreading panicles, similar in growth to those of the well-known Cabbage-tree.

BERRIES—These are as beautiful as the flowers, being formed in large clusters of close-set, transparent, wine-coloured fruit.

USES—The leaves are used by the Maoris for making sleeping-mats. The sweet berries are eaten as food.

NOTES—They grow at various heights, some of them being a hundred feet or more above the ground. When looked at from below, before the flowering season, they have the appearance of large bird-nests.

WILD FUCHSIA

GENERAL—Another common New Zealand bush plant, usually forming a somewhat straggling bush. Under favourable conditions it becomes a small tree.

LEAVES—Feather-shaped, with even edges. Veins are prominent on under surfaces. **Stalks,** relatively short. **Position,** growing alternately in fairly close proximity along a short leaf branch.

FLOWERS—Not so large as the garden or plant-pot variety, but otherwise very similar. **Calyx,** waxy yellow colour with four half-divided sepals, bending backwards at the tips. **Stamens,** eight long stamens, tipped with beautiful blue pollen. **Style,** much longer than the stamens, with prominent knobby stigma.

FRUIT—Egg-shaped and of deep purple colour.

NOTE—The tui and bell-bird collect honey from the nectaries of this plant.

LESSONS DIARY

This Diary will require modification in different Provinces; but it will be inadvisable to transfer the subjects allotted to the winter months to any other season of the year.

FEBRUARY—

The Aphides (Rose Aphis, Bean Aphis, etc.),
Blue Fairy Butterfly, Mosquito, Cicada.
Goldfinch, Kingfisher, Grey Warbler.
Centaury, Chicory, Vervain.

MARCH—

Hu-hu Beetle, Grass-hopper, Hover Fly, Crane Fly (Daddy Longlegs), Butterflies (omitting the White Butterfly).
Birds' Eggs, Tom-tit, Chaffinch.
Tarweed, Lady's Thumb, Foxglove.

APRIL—

Cricket, Woolly Aphis (Apple Aphis).
Californian Quail, White Eye (Blight Bird), Thrush.
Fairy Flax (Wild Linseed), Flannel Leaf (Mullein, Golden Rod).

MAY—

Stick Insect, Mantis.
Yellow-hammer, Kingfisher, Pukeko (Swamp Hen).
Periwinkle, Convolvulus, Red Ink Plant.

JUNE—

Ladybirds, Glow-worms.
Blackbird, Starling, Myna.
The Buttercups.

JULY—

Classification of Insects, and Specimens of each Class.
Birds' Nests, Kiwi.
The Dandelions.

AUGUST—

Woolly Bear Caterpillar Pupae.
House Sparrow, Wood Pigeon.
Raupo.

SEPTEMBER—

Basket Moth, Puriri Moth.
Bush Hawk, Pipit (Ground Lark).
Native Fuchsia, Mallow.

OCTOBER—

Bumble-bees, Day-flying Moth.
The Two Cuckoos, Grey Warbler.
Astelia, Bush Clematis, Evening Primrose.

NOVEMBER—

Grass-grub Beetle, Mason Wasp, Drone Fly.
Hedge Sparrow, Fantail, Skylark.
Speedwell, Bladder Campion, Pennyroyal.

DECEMBER—

Dragon-flies, Locusts, Giant Hawk Moth.
Tui, Bell-bird.
Scarlet Pimpernel, Creeping Mallow, Yarrow.

APPENDIX

OVIPOSITORS—The females of many insects have saws or piercing instruments concealed within part of the abdomen. In others, a comparatively long organ, called "ovipositor," is present, and is used for placing the insect's eggs in positions required in view of the particular food which will be needed by the larvae that emerge from these eggs. This position is sometimes below the surface of the ground, sometimes beneath the bark or in the cambium layer of a tree trunk or branch, and sometimes in the body of a caterpillar, grub or insect.

COCOONS—Many larvae give out a silky or cottony material from their bodies—notably those of the Honey Bee, the Day-Flying Moth and the Silkworm Moth—from which they cleverly spin a complete covering material in which to hide and be sheltered from unfavourable weather during the period of "pupation"—the period during which the wonderful metamorphosis resulting in the "perfect insect" is in progress. This covering, called a "cocoon," is of a very elaborate character. It usually has a beautiful appearance and is provided with a conical protuberance at one end, pierced by a **canal.** This canal is formed with great care by the larva, which from time to time pushes its head into the open end, and stretches it by opening its mouth. The object of the canal is probably to assist ventilation around the surface of the "pupa."

PLANT "GALLS"—This is the name given to the unsightly swellings often seen on the branches of wattle trees, oaks, roses, etc. They are caused by a great variety of insects and mites—the former usually one of the Hymenoptera (see p. 8). They are produced by the dividing of the plant tissues, usually in the cambium layer, which is brought about and developed by the presence of the insect larva. One or more eggs are laid in the plant tissue by the insect, and the larva from each exudes a secretion which combines with the plant juices. This has the effect of transforming the growth of the plant cells, so causing division and malformation of the plant tissues that produce the swellings or "galls."

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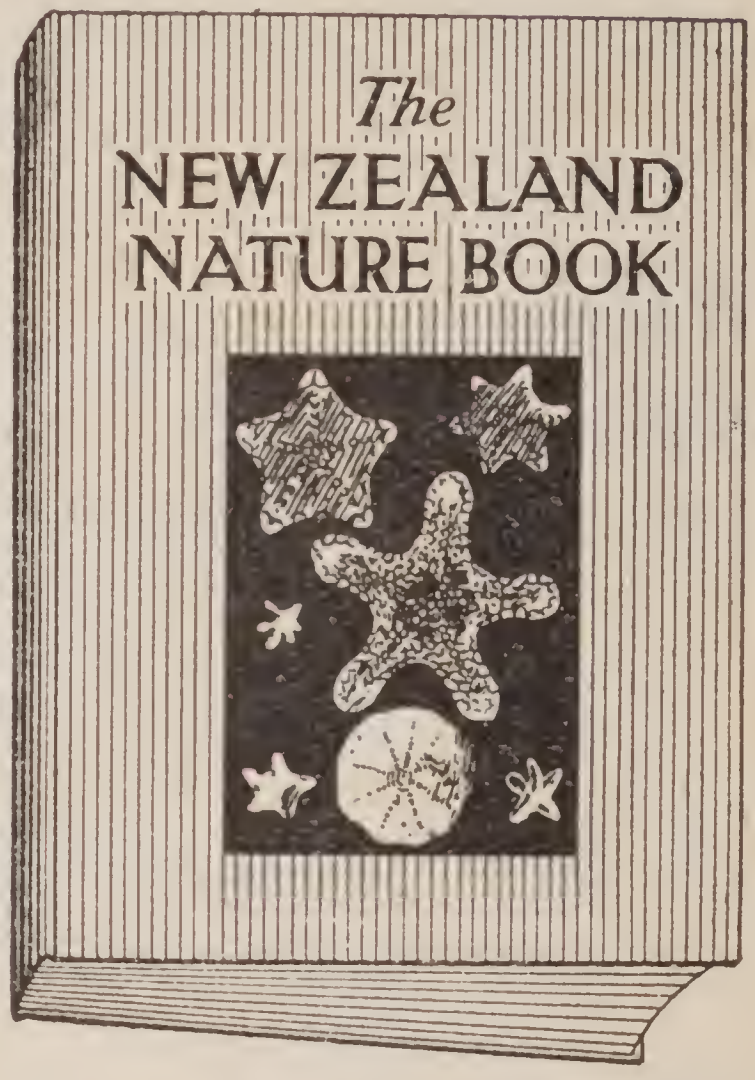

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